NATIONAL TRANSPORTATION SAFETY BOARD
Vehicle Recorders Division
Washington, D.C. 20594

February 15, 2002

Specialist's Factual Report of Investigation
Digital Flight Data Recorder

NTSB Number:
DCA01MA065

A. EVENT

Location:	Shanksville, Pennsylvania
Date:	September 11, 2001
Aircraft:	B-757-200, N591UA
Operator:	United Airlines

B. GROUP

N/A

C. DETAILS OF INVESTIGATION

In support of the Federal Bureau of Investigation's (FBI's) investigation into the terrorist act of United Airlines Flight 93, which crashed in Shanksville, Pennsylvania, on September 11, 2001, the NTSB Vehicle Recorders Division received the following solid state flight data recorder (SSFDR) on September 13, 2001:

Recorder Manufacturer/Model: **Allied Signal SSFDR**

The SSFDR was examined upon receipt. The recorder displayed evidence of impact damage (figure 1). The memory board was removed and also showed signs of impact damage (figure 2).
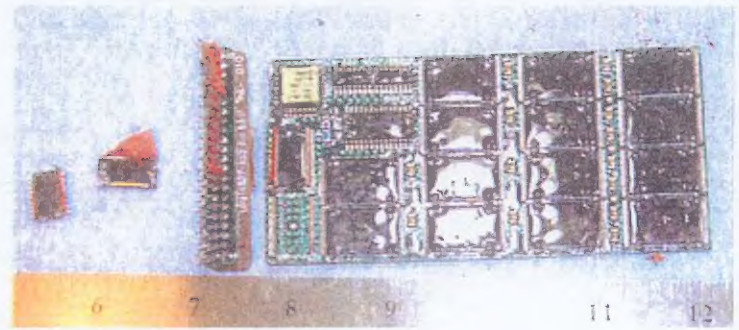
Figure 1

Figure 2

The memory board was taken to Honeywell facilities in Redmond, Washington for evaluation and downloading since the extent of the damage was not known. The data were extracted and electronically transferred to Safety Board headquarters. The transcribed data were reduced from the recorded binary values (0's and 1's) to engineering units (for example feet, knots, degrees, etc.) using conversion formulas obtained from United Airlines.[1] The transcribed data were processed by the Safety Board's Recovery Analysis and Presentation System (RAPS), which converted the raw data to engineering units and presented it in tabular and graphic form. An examination of the recovered data indicated that the recorder operated normally.

Only validated parameters are included in the plots and tabular data in this report. A list of these parameters is in Attachments I-1 to I-7. The remaining parameters either were not recorded properly or were not confirmed to have been recorded properly, and are not included in this report. A list of these parameters is in Attachments I-8 to I-10.

Recorder Description

This model SSFDR accepts serial bit stream data in an ARINC 573/717[2] format at a rate of 64 12-bit words per second. The SSFDR uses solid-state flash memory technology as the recording medium. The recording is stored in a crash survivable memory unit. A minimum of the last 25 hours of operational data is retained on the recording medium.

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[1] United Airlines provided their custom data frame which is based on Boeing's 757-4 data frame, Attachment IV: 757UALmap.xls.

[2] Flight Data Acquisition and Recording System Characteristic, Published by Aeronautical Radio, Inc. (ARINC), 2551 Riva Road, Annapolis, Maryland

The Digital Flight Data Acquisition Unit (DFDAU) provides a means of gathering, conditioning, and converting flight data parameters to digital data. The DFDAU provides a serial binary digital data stream to the SSFDR at a rate of 768 bits/sec. A binary, or logical one, is represented by a voltage transition between clock transitions.

The DFDAU input signals are time division multiplexed, with parameter identification established by means of position or time slot addresses in the serial data stream output. This output is a continuous sequence of four-second data frames. Each frame consists of four subframes of 64 separate 12-bit words, with the first word containing a unique 12-bit synchronization (sync) word identifying it as subframe 1,2,3, or 4. The data stream is "in sync" when successive sync words appear at the proper 64-word intervals. If the data stream is interrupted, sync words will not appear at the proper interval or sequence, and the time reference will be lost until the subframe pattern can be reestablished.

Time Correlation

The SSFDR data were correlated to local time (Eastern Daylight Time (EDT)). See the Time Correlation Report for further details on the correlation between SSFDR and local time.

Data and Graphs

Attachments II-1 to II-22 contain plots of those parameters that were recorded and validated. The timeframe of the plots is from 8:39:00 EDT to 10:04:00 EDT, with the last recorded data shown at 10:03:10 EDT.

The raw file for this data set contained 2 additional subframes (seconds) of data. The first of these two contained data in words 1, 2, 3, and 4 but the rest of the subframe were zeros. Word 1, which was a sync word, and word 2, which contained a vertical acceleration value of .640 g's, appeared to be valid data. The remaining 2 words could

not be validated and the remainder of the frame was considered invalid. The next subframe was determined to be a repeat of the previous subframe and was considered invalid[3]. These 2 subframes were not included in the plotted or tabular data.

The data plotted in Attachment II are available in tabular format as a comma delimited (*.csv) files in Attachment III. The tabular data are separated into 4 files alphabetically based on the parameter names.

Erin M. Gormley
Aerospace Engineer
Vehicle Recorders Division

Attachments I-1 to I-10   Parameter Listings
Attachments II-1 to II-22:   Plots of SSFDR Data
Attachment III (electronic):   DCA01MA065 tabular csv files
Attachment IV (electronic):   757UALmap.xls

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[3] This condition, where the last recorded subframe is repeated, is a known bug which occurs as a result of the SSFDR download software.

Attachment I

Parameter Listings

Parameters Validated

PORT NAME	PARAMETER ASSIGNMENT	PORT NAME	PARAMETER ASSIGNMENT
EFIS L/C-A-1	10 MI RANGE SEL CAPT	TMC L-D-4	A/T DISCONNECT
EFIS L/C-A-1	160 MI RANGE SEL CAPT	TMC L-D-4	A/T ENGAGE
EFIS L/C-A-1	20 MI RANGE SEL CAPT	TMC L-D-4	A/T G/A MODE ANNUN
EFIS L/C-A-1	40 MI RANGE SEL CAPT	EICAS L/R-A-1	AC BUS OFF - L
EFIS L/C-A-1	5 MI RANGE SEL CAPT	EICAS L/R-A-1	AC BUS OFF - R
EFIS L/C-A-1	80 MI RANGE SEL CAPT	EICAS L/R-A-1	AC BUS TIE ISOL - L
FCC C-A-4	A/P CAUTION	EICAS L/R-A-1	AC BUS TIE ISOL - R
FCC L-A-4	A/P CAUTION	DFDAU	ACMS S/W P/N CODE
FCC L-A-4	A/P CAUTION	ADC L/R-A-4	ADC INVALID
FCC R-A-4	A/P CAUTION	ADC SW	ADC SELECT SW-CAPT
FCC C-A-4	A/P CMD C ENGA	EFIS L/C-A-1	ADF/ VOR SEL CAPT
FCC L-A-4	A/P CMD C ENGA	EICAS L/R-A-1	AFT CARGO FIRE
FCC R-A-4	A/P CMD C ENGA	EICAS L/R-A-1	AILERON POSN-OUTER - L
MCP A-A-2	A/P CMD C ENGA	EICAS L/R-A-1	AILERON POSN-OUTER - R
FCC C-A-4	A/P CMD L ENGA	TMC L-D-4	AIR DRIVEN PUMP
FCC L-A-4	A/P CMD L ENGA	A/G RELAY	AIR/GROUND
FCC R-A-4	A/P CMD L ENGA	EFIS L/C-A-1	AIRPORTS CAPT
MCP A-A-2	A/P CMD L ENGA	EICAS L/R-A-1	ALL GEAR DOWN & LOCK
FCC C-A-4	A/P CMD R ENGA	FCC C-A-4	ALT HOLD MODE OPER
FCC L-A-4	A/P CMD R ENGA	FCC L-A-4	ALT HOLD MODE OPER
FCC R-A-4	A/P CMD R ENGA	FCC R-A-4	ALT HOLD MODE OPER
MCP A-A-2	A/P CMD R ENGA	MCP A-A-2	ALT HOLD MODE OPER
FCC C-A-4	A/P CWS C ENGA	FCC C-A-4	ALT MODE OPER
FCC L-A-4	A/P CWS C ENGA	FCC L-A-4	ALT MODE OPER
FCC R-A-4	A/P CWS C ENGA	FCC L-A-4	ALT MODE OPER
MCP A-A-2	A/P CWS C ENGA	FCC R-A-4	ALT MODE OPER
FCC C-A-4	A/P CWS L ENGA	ADC L/R-A-4	ALTITUDE (1013.25mB) COARSE
FCC L-A-4	A/P CWS L ENGA	ADC L/R-A-4	ALTITUDE (1013.25mB) FINE
FCC R-A-4	A/P CWS L ENGA	MCP A-A-2	ALTITUDE SELECTED-MAN
MCP A-A-2	A/P CWS L ENGA	EICAS L/R-A-1	ALTN EICAS COMP
FCC C-A-4	A/P CWS R ENGA	EICAS L/R-A-1	ANTI-SKID
FCC L-A-4	A/P CWS R ENGA	FCC C-A-4	APPR MODE OPER
FCC R-A-4	A/P CWS R ENGA	FCC L-A-4	APPR MODE OPER
MCP A-A-2	A/P CWS R ENGA	FCC L-A-4	APPR MODE OPER
FCC C-A-4	A/P ENGAGE DETENT	FCC R-A-4	APPR MODE OPER
FCC L-A-4	A/P ENGAGE DETENT	EICAS L/R-A-1	APU BLEED VALVE
FCC L-A-4	A/P ENGAGE DETENT	EICAS L/R-A-1	APU BUS AC VOLTS
FCC R-A-4	A/P ENGAGE DETENT	EICAS L/R-A-1	APU EGT
FCC L-A-4	A/P T.E. FLAP POSITION	EICAS L/R-A-1	APU FAULT
EICAS L/R-A-1	A/P WARN-2 BAT	EICAS L/R-A-1	APU FIRE
EICAS L/R-A-1	A/P WARN-2 NORM	EICAS L/R-A-1	APU GEN APB OPEN
FCC C-A-4	A/P WARNING	EICAS L/R-A-1	APU LOW OIL QUANT
FCC L-A-4	A/P WARNING	EICAS L/R-A-1	APU RPM
FCC L-A-4	A/P WARNING	FCC C-A-4	ATT HOLD MODE OPER
FCC R-A-4	A/P WARNING	FCC L-A-4	ATT HOLD MODE OPER

PORT NAME	PARAMETER ASSIGNMENT	PORT NAME	PARAMETER ASSIGNMENT
FCC L-A-4	ATT HOLD MODE OPER	EICAS L/R-A-1	C-R FUEL PUMP LT
FCC R-A-4	ATT HOLD MODE OPER	EICAS L/R-A-1	C-R FUEL PUMP PR
EICAS L/R-A-1	AUTO BRAKE	TMC L-D-4	CRZ MODE OPER
EICAS L/R-A-1	AUTO SPEEDBRAKE	CONFIG	CUSTOMER UNIQUE FRAME
FCC C-A-4	AUTOLAND WARN LT	CAPT CLOCK	DAY X 1
FCC L-A-4	AUTOLAND WARN LT	CAPT CLOCK	DAY X10
FCC L-A-4	AUTOLAND WARN LT	DME L-A-2	DME ANTENNA FAILURE - L
FCC R-A-4	AUTOLAND WARN LT	DME R-A-2	DME ANTENNA FAILURE - R
EICAS L/R-A-1	AUTOTHROTTLE DISC	DME L-A-2	DME DISTANCE-LEFT
FCC C-A-4	AUTOTRIM DOWN - ARM	DME R-A-2	DME DISTANCE-RIGHT
FCC L-A-4	AUTOTRIM DOWN - ARM	DME L-A-2	DME FAILURE - L
FCC R-A-4	AUTOTRIM DOWN - ARM	DME R-A-2	DME FAILURE - R
FCC C-A-4	AUTOTRIM DOWN - CONT	EFIS L/C-A-1	DME SELECTED CAPT
FCC L-A-4	AUTOTRIM DOWN - CONT	FMC L/R-D-4	DME/DME
FCC R-A-4	AUTOTRIM DOWN - CONT	GPWC L-A-1	DON'T SINK
FCC C-A-4	AUTOTRIM UP - ARM	FMC L/R-D-4	DRIFT ANGLE
FCC L-A-4	AUTOTRIM UP - ARM	TMC L-D-4	ECS PACK H/L LEFT
FCC R-A-4	AUTOTRIM UP - ARM	TMC L-D-4	ECS PACK H/L RIGHT
FCC C-A-4	AUTOTRIM UP - CONT	EICAS L/R-A-1	ECS PACK OFF - L
FCC L-A-4	AUTOTRIM UP - CONT	EICAS L/R-A-1	ECS PACK OFF - R
FCC R-A-4	AUTOTRIM UP - CONT	TMC L-D-4	ECS PACK ON/OFF LEFT
FCC C-A-4	B/CRS MODE OPER	TMC L-D-4	ECS PACK ON/OFF RIGHT
FCC L-A-4	B/CRS MODE OPER	EICAS L/R-A-1	ECS PACK OVHT - L
FCC L-A-4	B/CRS MODE OPER	EICAS L/R-A-1	ECS PACK OVHT - R
FCC R-A-4	B/CRS MODE OPER	TMC L-D-4	EEC VALID - L
ADC L/R-A-4	BARO COR NO. 1 (IN)	TMC L-D-4	EEC VALID - R
ADC L/R-A-4	BARO COR NO. 2 (IN)	EFIS SW	EFIS SELECT SW-CAPT
EICAS L/R-A-1	BLEED DUCT PRESS - L	EICAS L/R-A-1	EICAS ALT DISAGREE
EICAS L/R-A-1	BRAKE TEMP LT	EICAS L/R-A-1	EICAS COMPUTER
EICAS L/R-A-1	CABIN ALT > 10kft	EICAS L/R-A-1	EICAS IAS DISAGREE
EICAS L/R-A-1	CAPT INST BUS XFER	EICAS SW	EICAS SELECT SW
EICAS L/R-A-1	CARGO FIRE SW	EICAS L/R-A-1	ELEVATOR FEEL SYSTEM
GPWC L-A-1	CAUTION OBST OR OBSTAHEAD	EICAS L/R-A-1	ELEVATOR POSN - L
GPWC L-A-1	CAUTION TERRAIN	EICAS L/R-A-1	ELEVATOR POSN - R
GPWC L-A-1	CAUTION WINDSHEAR	EICAS L/R-A-1	EMERGENCY LIGHTS
EICAS L/R-A-1	CDU MENU REQUEST	EICAS L/R-A-1	ENG EPR COMMAND - L
EICAS L/R-A-1	C-L FUEL PUMP LT	EICAS L/R-A-1	ENG EPR LIMIT-L
EICAS L/R-A-1	C-L FUEL PUMP PR	EICAS L/R-A-1	ENG EPR LIMIT-R
TMC L-D-4	CLB MODE OPER	EICAS L/R-A-1	ENG EPR-ACTUAL - L
EFIS L/C-A-1	COMPAR ENABLE CAPT	EICAS L/R-A-1	ENG EPR-ACTUAL - R
ADC L/R-A-4	COMPUTED AIRSPEED	EICAS L/R-A-1	ENG FUEL CUTOFF - L
TMC L-D-4	CON MODE OPER	EICAS L/R-A-1	ENG FUEL CUTOFF - R
SYNCHRO	CONTROL COLUMN POSN-CAPT	EICAS L/R-A-1	ENG FUEL FILTER - L
SYNCHRO	CONTROL COLUMN POSN-CAPT	EICAS L/R-A-1	ENG FUEL FILTER - R
SYNCHRO	CONTROL WHEEL POSN-CAPT	EICAS L/R-A-1	ENG FUEL FLOW - L
SYNCHRO	CONTROL WHEEL POSN-CAPT	EICAS L/R-A-1	ENG FUEL FLOW - R
EFIS L/C-A-1	CP FAULT - LEFT	EICAS L/R-A-1	ENG FUEL VALVE - L

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PORT NAME	PARAMETER ASSIGNMENT	PORT NAME	PARAMETER ASSIGNMENT
EICAS L/R-A-1	ENG FUEL VALVE - R	FCC L-A-4	FLARE OPER
EICAS L/R-A-1	ENG LO OIL PRESS - L	FCC R-A-4	FLARE OPER
EICAS L/R-A-1	ENG LO OIL PRESS - R	MCP A-A-2	FLARE OPER
EICAS L/R-A-1	ENG N1-ACTUAL - L	TMC L-D-4	FLARE RETARD MODE
EICAS L/R-A-1	ENG N1-ACTUAL - R	FCC C-A-4	FLT DIR ON-CAPT
EICAS L/R-A-1	ENG N2-ACTUAL - L	FCC L-A-4	FLT DIR ON-CAPT
EICAS L/R-A-1	ENG N2-ACTUAL - R	FCC R-A-4	FLT DIR ON-CAPT
EICAS L/R-A-1	ENG OIL FILTER - L	MCP A-A-2	FLT DIR ON-CAPT
EICAS L/R-A-1	ENG OIL FILTER - R	FCC C-A-4	FLT DIR ON-F/O
EICAS L/R-A-1	ENG OIL PRES - L	FCC L-A-4	FLT DIR ON-F/O
EICAS L/R-A-1	ENG OIL PRES - R	FCC R-A-4	FLT DIR ON-F/O
EICAS L/R-A-1	ENG OIL QTY - L	MCP A-A-2	FLT DIR ON-F/O
EICAS L/R-A-1	ENG OIL QTY - R	FCC C-A-4	FMA FAULT 1 (CWS)
EICAS L/R-A-1	ENG OIL TEMP - L	FCC L-A-4	FMA FAULT 1 (CWS)
EICAS L/R-A-1	ENG OIL TEMP - R	FCC L-A-4	FMA FAULT 1 (CWS)
EICAS L/R-A-1	ENG OUT RLY - L	FCC R-A-4	FMA FAULT 1 (CWS)
EICAS L/R-A-1	ENG OUT RLY - R	FCC C-A-4	FMA FAULT 2 (PTCH)
EICAS L/R-A-1	ENG START VALVE - L	FCC L-A-4	FMA FAULT 2 (PTCH)
EICAS L/R-A-1	ENG START VALVE - R	FCC L-A-4	FMA FAULT 2 (PTCH)
EICAS L/R-A-1	ENG STARTER - L	FCC R-A-4	FMA FAULT 2 (PTCH)
EICAS L/R-A-1	ENG STARTER - R	FCC C-A-4	FMA FAULT 3 (ROLL)
EICAS L/R-A-1	ENG VIBRATION - L	FCC L-A-4	FMA FAULT 3 (ROLL)
EICAS L/R-A-1	ENG VIBRATION - R	FCC L-A-4	FMA FAULT 3 (ROLL)
EICAS L/R-A-1	ENGINE FIRE - L	FCC R-A-4	FMA FAULT 3 (ROLL)
EICAS L/R-A-1	ENGINE FIRE - R	EFIS L/C-A-1	FMC SELECTED CAPT
EICAS L/R-A-1	ENGINE OVHT - L	DFDAU	FMC/IRU DATA SOURCE
EICAS L/R-A-1	ENGINE OVHT - R	EEC L-A-1	FOD DET - L
EICAS L/R-A-1	EPR TARGET-FMC	EEC R-A-1	FOD DET - R
EICAS L/R-A-1	F/O INST BUS XFER	EFIS L/C-A-1	FPM ENABLE CAPT
EICAS L/R-A-1	FILTER 1 VIB - L	DFDAU	FRAME COUNTER
EICAS L/R-A-1	FILTER 1 VIB-R	EICAS L/R-A-1	FSEU FAULT (STATUS)
EICAS L/R-A-1	FILTER 2 VIB - L	EICAS L/R-A-1	FUEL CONFIG
EICAS L/R-A-1	FILTER 2 VIB - R	EFIS L/C-A-1	FULL COMPASS ROSE CAPT
EICAS L/R-A-1	FIRE EXT SWITCH - L	EICAS L/R-A-1	FWD CARGO FIRE
EICAS L/R-A-1	FIRE EXT SWITCH - R	EICAS L/R-A-1	FWD EQUIP SMOKE
FCC C-A-4	FL CH MODE OPER	TMC L-D-4	G/A MODE OPER
FCC L-A-4	FL CH MODE OPER	FCC C-A-4	G/A MODE OPER-P
FCC R-A-4	FL CH MODE OPER	FCC L-A-4	G/A MODE OPER-P
MCP A-A-2	FL CH MODE OPER	FCC L-A-4	G/A MODE OPER-P
TMC L-D-4	FL CH MODE OPER	FCC R-A-4	G/A MODE OPER-P
FSEU	FLAP HANDLE POSN	FCC C-A-4	G/A MODE OPER-R
FCC C-A-4	FLAP LIMIT	FCC L-A-4	G/A MODE OPER-R
FCC L-A-4	FLAP LIMIT	FCC L-A-4	G/A MODE OPER-R
FCC L-A-4	FLAP LIMIT	FCC R-A-4	G/A MODE OPER-R
FCC R-A-4	FLAP LIMIT	FCC C-A-4	G/S MODE OPER
TMC L-D-4	FLAP LIMIT	FCC L-A-4	G/S MODE OPER
FCC C-A-4	FLARE OPER	FCC R-A-4	G/S MODE OPER

PORT NAME	PARAMETER ASSIGNMENT	PORT NAME	PARAMETER ASSIGNMENT
MCP A-A-2	G/S MODE OPER	FCC L-A-4	IAS LIMIT OPER
EICAS L/R-A-1	GEAR DISAGREE SYS 1	FCC L-A-4	IAS LIMIT OPER
EICAS L/R-A-1	GEAR DISAGREE SYS 2	FCC R-A-4	IAS LIMIT OPER
GPWC L-A-1	GLIDESLOPE	TMC L-D-4	IAS MODE OPER
GPWC L-A-1	GLIDESLOPE CANCEL	EICAS L/R-A-1	IDG OIL LEVEL - L
CAPT CLOCK	GMT HOURS	EICAS L/R-A-1	IDG OIL TEMP-L
CAPT CLOCK	GMT MINUTES	TMC L-D-4	IDLE THRUST OPER
CAPT CLOCK	GMT SECONDS	EFIS L/C-A-1	ILS (MOD) MODE SEL CAPT
FMC L/R-D-4	GPS	EFIS L/C-A-1	ILS (STD) MODE SEL CAPT
GPWC L-A-1	GPWC FAILURE	EFIS L/C-A-1	ILS SELECTED CAPT
GPWC L-A-1	GPWS ALERT	ADC L/R-A-4	INDICATED AOA
GPWC L-A-1	GPWS ALERT	ADC L/R-A-4	INDICATED AOA
EICAS L/R-A-1	GROSS WEIGHT	VOR L-A-2	INNER MARKER
GPWC L-A-1	GROUND PROX INOP	FMC L/R-D-4	IRS (3) MODE OPER
GPWC L-A-1	GROUND PROX WARNING	FMC L/R-D-4	IRS (C) MODE OPER
GPWC L-A-1	GROUND PROX WARNING	FMC L/R-D-4	IRS (L) MODE OPER
EFIS L/C-A-1	GROUNDSPEED CAPT	FMC L/R-D-4	IRS (R) MODE OPER
FCC C-A-4	HDG HOLD MODE OPER	IRS SW	IRS SELECT SW-CAPT
FCC L-A-4	HDG HOLD MODE OPER	FMC L/R-D-4	IRS/LOC
FCC R-A-4	HDG HOLD MODE OPER	FMC L/R-D-4	IRS/MLS
MCP A-A-2	HDG HOLD MODE OPER	EFIS L/C-A-1	IRU SELECTED CAPT
FCC C-A-4	HDG SEL MODE OPER	TMC L-D-4	ISOLATION VALVE-L
FCC L-A-4	HDG SEL MODE OPER	TMC L-D-4	ISOLATION VALVE-R
FCC R-A-4	HDG SEL MODE OPER	EICAS L/R-A-1	L BLEED DUCT LEAK
MCP A-A-2	HDG SEL MODE OPER	FCC C-A-4	L NAV MODE OPER
MCP A-A-2	HEADING SELECTED	FCC L-A-4	L NAV MODE OPER
L HF	HF-LEFT KEYING	FCC R-A-4	L NAV MODE OPER
R HF	HF-RIGHT KEYING	MCP A-A-2	L NAV MODE OPER
EICAS L/R-A-1	HYD BRAKE SOURCE	EICAS L/R-A-1	L.E. SLAT DISAGREE
EICAS L/R-A-1	HYD GENERATOR	EICAS L/R-A-1	L.E. SLAT DISAGREE
EICAS L/R-A-1	HYD PRES - C	EICAS L/R-A-1	L.E. SLATS ASYM
EICAS L/R-A-1	HYD PRES - L	FSEU	L.E. SLATS EXTEND
EICAS L/R-A-1	HYD PRES - R	FSEU	L.E. SLATS EXTEND
EICAS L/R-A-1	HYD RSVR PRESS < 17 - C	FSEU	L.E. SLATS FAIL
EICAS L/R-A-1	HYD RSVR PRESS < 17 - L	FSEU	L.E. SLATS PART EXTEND
EICAS L/R-A-1	HYD RSVR PRESS < 17 - R	FSEU	L.E. SLATS PART EXTEND
EICAS L/R-A-1	HYD SYS LO PRESS - C	FSEU	L.E. SLATS RETRACTED
EICAS L/R-A-1	HYD SYS LO PRESS - C	FSEU	L.E. SLATS RETRACTED
EICAS L/R-A-1	HYD SYS LO PRESS - L	FCC C-A-4	LAND 2 (GREEN)
EICAS L/R-A-1	HYD SYS LO PRESS - L	FCC L-A-4	LAND 2 (GREEN)
EICAS L/R-A-1	HYD SYS LO PRESS - R	FCC L-A-4	LAND 2 (GREEN)
EICAS L/R-A-1	HYD SYS LO PRESS - R	FCC R-A-4	LAND 2 (GREEN)
FCC C-A-4	IAS	FCC C-A-4	LAND 3 (GREEN)
FCC L-A-4	IAS	FCC L-A-4	LAND 3 (GREEN)
FCC L-A-4	IAS	FCC L-A-4	LAND 3 (GREEN)
FCC R-A-4	IAS	FCC R-A-4	LAND 3 (GREEN)
FCC C-A-4	IAS LIMIT OPER	ACCEL	LATERAL ACCELERATION

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PORT NAME	PARAMETER ASSIGNMENT	PORT NAME	PARAMETER ASSIGNMENT
ACCEL	LATERAL ACCELERATION	FCC C-A-4	MIN SPEED
ACCEL	LATERAL ACCELERATION	FCC L-A-4	MIN SPEED
ACCEL	LATERAL ACCELERATION	FCC R-A-4	MIN SPEED
EICAS L/R-A-1	LAVATORY SMOKE (C)	TMC L-D-4	MIN SPEED
EICAS L/R-A-1	LDG CONFIG - GEAR	GPWC L-A-1	MINIMUMS
EICAS L/R-A-1	LDG CONFIG-SPD BK	EFIS L/C-A-1	MLS SELECT CAPT
EICAS L/R-A-1	LDG GEAR LEVER	EFIS L/C-A-1	MLS/ILS SOURCE SEL CAPT
FCC C-A-4	LOC MODE OPER	CAPT CLOCK	MONTH X 1
FCC L-A-4	LOC MODE OPER	CAPT CLOCK	MONTH X10
FCC R-A-4	LOC MODE OPER	EFIS L/C-A-1	NAV AIDS CAPT
MCP A-A-2	LOC MODE OPER	EFIS L/C-A-1	NAV MODE SEL CAPT
FMC L/R-D-4	LOC/DME MODE OPER	ADC L/R-A-4	NO. 1 AOA HEAT ON
ACCEL	LONGITUDINAL ACCEL	ADC L/R-A-4	NO. 2 AOA HEAT ON
ACCEL	LONGITUDINAL ACCEL	GPWC L-A-1	NOT USED
ACCEL	LONGITUDINAL ACCEL	GPWC L-A-1	OBSTACLE WARNING
ACCEL	LONGITUDINAL ACCEL	VOR L-A-2	OUTER MARKER
EICAS L/R-A-1	LOW FUEL QTY	ADC L/R-A-4	OVERSPEED
LRRA C-A-2	LRRA FAILURE - C	EICAS L/R-A-1	PARKING BRAKE ON
LRRA L-A-2	LRRA FAILURE - L	EICAS L/R-A-1	PASS OXY ON
LRRA R-A-2	LRRA FAILURE - R	EFIS L/C-A-1	PITCH ANGLE CAPT
LRRA C-A-2	LRRA REVEIVE ANTENNA - C	EFIS L/C-A-1	PITCH DISAGREE CAPT
LRRA L-A-2	LRRA REVEIVE ANTENNA - L	EFIS L/C-A-1	PLAN MODE SEL CAPT
LRRA R-A-2	LRRA REVEIVE ANTENNA - R	EICAS L/R-A-1	POWER XFER UNIT
LRRA C-A-2	LRRA TRANSMIT ANTENNA - C	CONFIG	PRE 97 RULE
LRRA L-A-2	LRRA TRANSMIT ANTENNA - L	GPWC-L-A-1	PREDICTIVE WINDSHEAR
LRRA R-A-2	LRRA TRANSMIT ANTENNA - R	GPWC L-A-1	PULL UP
FCC C-A-4	MACH	FCC C-A-4	PVD ENABLE
FCC L-A-4	MACH	FCC L-A-4	PVD ENABLE
FCC L-A-4	MACH	FCC L-A-4	PVD ENABLE
FCC R-A-4	MACH	FCC R-A-4	PVD ENABLE
FCC C-A-4	MACH LIMIT OPER	EICAS L/R-A-1	R BLEED DUCT LEAK
FCC L-A-4	MACH LIMIT OPER	EICAS L/R-A-1	R ENG BLEED OVHT
FCC L-A-4	MACH LIMIT OPER	EICAS L/R-A-1	RAT UNLOCKED
FCC R-A-4	MACH LIMIT OPER	TMC L-D-4	RATING 1 OPER
TMC L-D-4	MACH MODE OPER	TMC L-D-4	RATING 2 OPER
MCP A-A-2	MACH SELECTED-MAN	FMC L/R-D-4	REQ'D NAV PERF-(RNP)
EICAS L/R-A-1	MACH SPEED TRIM	EEC L-A-1	REVERSER STATUS - L
EFIS L/C-A-1	MAG HEADING CAPT	EEC R-A-1	REVERSER STATUS - R
EICAS L/R-A-1	MAIN CARGO FIRE	EFIS L/C-A-1	ROLL ANGLE CAPT
DFDAU	MANDATORY S/W P/N CODE	EFIS L/C-A-1	ROLL DISAGREE CAPT
DFDAU	MANUFACTURER CODE	FCC C-A-4	ROLLOUT MODE OPER
EFIS L/C-A-1	MAP MODE SELECT CAPT	FCC L-A-4	ROLLOUT MODE OPER
EFIS L/C-A-1	MAP SOURCE CAPT	FCC L-A-4	ROLLOUT MODE OPER
EICAS L/R-A-1	MASTER CAUTION LIGHT	FCC R-A-4	ROLLOUT MODE OPER
WEU WARN	MASTER WARNING CAPT	EICAS L/R-A-1	RSV BRAKE VALVE
WEU WARN	MASTER WARNING F/O	EFIS L/C-A-1	RTE DATA CAPT
VOR L-A-2	MIDDLE MARKER	EICAS L/R-A-1	RUDD RATIO MODULE

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PORT NAME	PARAMETER ASSIGNMENT	PORT NAME	PARAMETER ASSIGNMENT
SYNCHRO	RUDDER PEDAL POSN	EICAS L/R-A-1	T.E. FLAPS DISAGREE
SYNCHRO	RUDDER PEDAL POSN	EICAS L/R-A-1	T.E. FLAPS DISAGREE
EICAS L/R-A-1	RUDDER POSITION	EEC L-A-1	T/L RSLVR ANGLE-LEFT
EICAS L/R-A-1	RUDDER POSITION	EEC R-A-1	T/L RSLVR ANGLE-RIGHT
EICAS L/R-A-1	RUDDER RATIO SYS	EICAS L/R-A-1	T/O CONFIG FLAPS
DFDAU	S/F CYCLE COUNT 0	EICAS L/R-A-1	T/O CONFIG PARK BRK
DFDAU	S/F CYCLE COUNT 1	EICAS L/R-A-1	T/O CONFIG SPOILER
DFDAU	S/F CYCLE COUNT 2	EICAS L/R-A-1	T/O CONFIG STAB
DFDAU	S/F CYCLE COUNT 3	FCC C-A-4	T/O MODE OPER-P
DFDAU	S/F CYCLE COUNT 4	FCC L-A-4	T/O MODE OPER-P
DFDAU	S/F CYCLE COUNT 5	FCC L-A-4	T/O MODE OPER-P
DFDAU	S/F CYCLE COUNT 6	FCC R-A-4	T/O MODE OPER-P
DFDAU	S/F CYCLE COUNT 7	FCC C-A-4	T/O MODE OPER-R
DFDAU	S/F CYCLE COUNT 8	FCC L-A-4	T/O MODE OPER-R
DFDAU	S/F CYCLE COUNT 9	FCC R-A-4	T/O MODE OPER-R
DFDAU	S/F CYCLE COUNT 10	TMC L-D-4	T/O MODE OPER-R
DFDAU	S/F CYCLE COUNT 11	EICAS L/R-A-1	T/R DEPLOYED - L
DFDAU	S/F CYCLE COUNT 12	EICAS L/R-A-1	T/R DEPLOYED - R
DFDAU	S/F CYCLE COUNT 13	EICAS L/R-A-1	T/R INTRANSIT - L
DFDAU	S/F CYCLE COUNT 14	EICAS L/R-A-1	T/R INTRANSIT - R
DFDAU	S/F CYCLE COUNT 15	EICAS L/R-A-1	TAT PROBE HEAT
EFIS L/C-A-1	SG FAULT- LEFT	EFIS L/C-A-1	TCAS DATA DISPLAYED CAPT
TMC L-D-4	SHUTOFF VALVE LEFT	EFIS L/C-A-1	TCAS DATA SELECTED CAPT
TMC L-D-4	SHUTOFF VALVE RIGHT	EFIS L/C-A-1	TCAS DATA SELECTED CAPT
GPWC L-A-1	SINK RATE	GPWC L-A-1	TERRAIN
GPWC L-A-1	SIREN WINDSHEAR WINDSHEAR	GPWC L-A-1	TERRAIN AHEAD
FCC C-A-4	SPD BRK HDL POSN	GPWC L-A-1	TERRAIN AHEAD PULL UP
FCC L-A-4	SPD BRK HDL POSN	GPWC L-A-1	TERRAIN AWARENESS INOP
FCC R-A-4	SPD BRK HDL POSN	GPWC L-A-1	TERRAIN AWARENESS NOT AVAIL
MCP A-A-2	SPD BRK HDL POSN	GPWC L-A-1	TERRAIN CAUTION
MCP A-A-2	SPD DISPLAY BLANK	EFIS L/C-A-1	TERRAIN DATA DISPLAYED CAPT
TMC L-D-4	SPD LIMIT	EFIS L/C-A-1	TERRAIN DATA SELECTED CAPT
MCP A-A-2	SPEED SELECTED-MAN	EFIS L/C-A-1	TERRAIN DATA SELECTED CAPT
EICAS L/R-A-1	SPOILER MODULE	GPWC L-A-1	TERRAIN DISPLAY DISCRETE 1 ON
EICAS L/R-A-1	SPOILER SYSTEM	GPWC L-A-1	TERRAIN DISPLAY DISCRETE 2 ON
FCC C-A-4	STAB POSITION	GPWC L-A-1	TERRAIN OVERRIDE
FCC L-A-4	STAB POSITION	GPWC L-A-1	TERRAIN WARNING
FCC R-A-4	STAB POSITION	TMC L-D-4	THROTTLE HLD ANNUN
MCP A-A-2	STAB POSITION	TMC L-D-4	THRUST MODE OPER
EICAS L/R-A-1	STAB TRIM FAULT	TMC L-D-4	TMC VALID
EICAS L/R-A-1	STAB TRIM MODULE	TMC L-D-4	TMC V-NAV OPER
ADC L/R-A-4	STATIC PRESSURE	GPWC L-A-1	TOO LOW FLAP
EICAS L/R-A-1	STATOR VANE POSN - L	GPWC L-A-1	TOO LOW GEAR
EICAS L/R-A-1	STATOR VANE POSN - R	GPWC L-A-1	TOO LOW TERRAIN
EFIS L/C-A-1	SWC SELECT CAPT	ADC L/R-A-4	TOTAL AIR TEMP
DFDAU	SYNC WORD	EICAS L/R-A-1	UNSCHED STAB MOVE
EICAS L/R-A-1	T.E. FLAP ASYM	EICAS L/R-A-1	UTIL BUS OFF - L

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PORT NAME	PARAMETER ASSIGNMENT	PORT NAME	PARAMETER ASSIGNMENT
EICAS L/R-A-1	UTIL BUS OFF - R	VOR L-A-2	VOR FREQUENCY-LEFT
FCC C-A-4	V NAV MODE OPER	VOR R-A-2	VOR FREQUENCY-RIGHT
FCC L-A-4	V NAV MODE OPER	VOR L-A-2	VOR MB FAILURE - L
FCC R-A-4	V NAV MODE OPER	EFIS L/C-A-1	VOR SELECTED CAPT
MCP A-A-2	V NAV MODE OPER	FMC L/R-D-4	VOR/DME
FCC C-A-4	V/S MODE OPER	EICAS L/R-A-1	WHEEL WELL FIRE
FCC L-A-4	V/S MODE OPER	FMC L/R-D-4	WIND DIRECTION TRUE
FCC R-A-4	V/S MODE OPER	FMC L/R-D-4	WIND SPEED
MCP A-A-2	V/S MODE OPER	GPWC L-A-1	WINDSHEAR CAUTION
DFDAU	VENDOR DATABASE CODE	GPWC L-A-1	WINDSHEAR INOP
MCP A-A-2	VERT SPEED SELECTED	GPWC L-A-1	WINDSHEAR WARNING
ACCEL	VERTICAL ACCELERATION	GPWC L-A-1	WINDSHEAR WARNING
ACCEL	VERTICAL ACCELERATION	TMC L-D-4	WING ANTI-ICE
ACCEL	VERTICAL ACCELERATION	EFIS L/C-A-1	WPT CAPT
ACCEL	VERTICAL ACCELERATION	EFIS L/C-A-1	WXR DATA CAPT
ACCEL	VERTICAL ACCELERATION	EFIS L/C-A-1	WXR DATA DISPLAYED CAPT
ACCEL	VERTICAL ACCELERATION	EFIS L/C-A-1	WXR DATA SELECTED CAPT
ACCEL	VERTICAL ACCELERATION	EFIS L/C-A-1	WXR DATA SELECTED CAPT
ACCEL	VERTICAL ACCELERATION	EFIS L/C-A-1	WXR SELECTED CAPT
C VHF	VHF CENTER KEYING	EICAS L/R-A-1	YAW DAMPER - L
L VHF	VHF LEFT KEYING	EICAS L/R-A-1	YAW DAMPER - R
R VHF	VHF RIGHT KEYING	EICAS L/R-A-1	YAW DAMPER MODULE
EFIS L/C-A-1	VOR (MOD) MODE SEL CAPT	CAPT CLOCK	YEAR X 1
EFIS L/C-A-1	VOR (STD) MODE SEL CAPT	CAPT CLOCK	YEAR X10
VOR L-A-2	VOR FAILURE - L		
VOR R-A-2	VOR FAILURE - R		

Parameters Not Working or Unconfirmed

PORT NAME	PARAMETER ASSIGNMENT	PORT NAME	PARAMETER ASSIGNMENT
A/C IDENT	A/C NUMBER LSB	DFDAU	DOC DEPART MSC
A/C IDENT	A/C NUMBER LSB + 1	DFDAU	DOC DEST LSC
A/C IDENT	A/C NUMBER LSB + 2	DFDAU	DOC DEST LSC + 1
A/C IDENT	A/C NUMBER LSB + 3	DFDAU	DOC DEST MSC
A/C IDENT	A/C NUMBER LSB + 4	DFDAU	DOC FLT NUMBER LSC
A/C IDENT	A/C NUMBER LSB + 5	DFDAU	DOC FLT NUMBER LSC+1
A/C IDENT	A/C NUMBER LSB + 6	DFDAU	DOC FLT NUMBER LSC+2
A/C IDENT	A/C NUMBER MSB	DFDAU	DOC FLT NUMBER MSC
A/C IDENT	A/C TYPE LSB	DFDAU	DOC LEG NUMBER
A/C IDENT	A/C TYPE LSB+1	TCAS	DOWN ADVISORY
A/C IDENT	A/C TYPE LSB+2	EICAS L/R-A-1	EICAS DISPALY STATE
A/C IDENT	A/C TYPE LSB+3	EICAS L/R-A-1	ENG BLEED OFF - L
A/C IDENT	A/C TYPE LSB+4	EICAS L/R-A-1	ENG BLEED OFF - R
A/C IDENT	A/C TYPE LSB+5	EICAS L/R-A-1	ENG EGT-LEFT
A/C IDENT	A/C TYPE MSB	EICAS L/R-A-1	ENG EGT-RIGHT
FMC L/R-D-4	ACTUAL NAV PERF-(ANP)	EICAS L/R-A-1	ENG EPR COMMAND - R
TCAS	ADV ALT RATE	EICAS L/R-A-1	ENG FUEL PRES - L
EICAS L/R-A-1	AFT EQUIP SMOKE	EICAS L/R-A-1	ENG FUEL PRES - R
TCAS	ALTITUDE REPORTING	TMC L-D-4	ENGINE IDENT 1
TCAS	ALTITUDE SELECT	TMC L-D-4	ENGINE IDENT 10
EICAS L/R-A-1	APU BUS FREQ	TMC L-D-4	ENGINE IDENT 11
EICAS L/R-A-1	APU LOAD	TMC L-D-4	ENGINE IDENT 12
EICAS L/R-A-1	APU OIL LEVEL	TMC L-D-4	ENGINE IDENT 2
EICAS L/R-A-1	BLEED DUCT PRESS - R	TMC L-D-4	ENGINE IDENT 3
A/G RELAY	BOGIE TILT LEFT	TMC L-D-4	ENGINE IDENT 4
A/G RELAY	BOGIE TILT RIGHT	TMC L-D-4	ENGINE IDENT 5
PRESS SENSOR	BRAKE PRES ALT-LEFT	TMC L-D-4	ENGINE IDENT 6
PRESS SENSOR	BRAKE PRES ALT-RIGHT	TMC L-D-4	ENGINE IDENT 7
PRESS SENSOR	BRAKE PRES MAIN-LEFT	TMC L-D-4	ENGINE IDENT 8
PRESS SENSOR	BRAKE PRES MAIN-RIGHT	TMC L-D-4	ENGINE IDENT 9
EICAS L/R-A-1	BUS AC VOLTS L	TMC L-D-4	EPR BUG DRIVE LEFT
EICAS L/R-A-1	BUS AC VOLTS R	TMC L-D-4	EPR BUG DRIVE RIGHT
EFIS L/C-A-1	C FCC DATA FAULT CAPT	EICAS L/R-A-1	EQUIP OVHT
EFIS L/C-A-1	C IRS DATA FAULT CAPT	EVENT SW	EVENT MARKER (RESV)
TCAS	COMBINED CONT	A/C IDENT	FLEET IDENT LSB
TMC L-D-4	COWL ANTI-ICE - L	A/C IDENT	FLEET IDENT LSB + 1
TMC L-D-4	COWL ANTI-ICE - R	A/C IDENT	FLEET IDENT LSB + 2
ILS C-A-2/MMR C	DATA LINK STATUS	A/C IDENT	FLEET IDENT MSB
ILS L-A-2/MMR L	DATA LINK STATUS	EICAS L/R-A-1	FLT DECK EQ SMOKE
ILS R-A-2/MMR R	DATA LINK STATUS	EICAS L/R-A-1	FMC FAIL - L
EICAS L/R-A-1	DC BUS TIE	EICAS L/R-A-1	FMC FAIL - R
FMC L/R-D-4	DESIRED TRACK	FMC SW	FMC SELECT SW A-CAPT
EFIS L/C-A-1	DH SELECTED CAPT	FMC SW	FMC SELECT SW B-CAPT
DFDAU	DOC DEPART LSC	CONFIG	FRAME SEL LSB
DFDAU	DOC DEPART LSC + 1	CONFIG	FRAME SEL MSB

PORT NAME	PARAMETER ASSIGNMENT	PORT NAME	PARAMETER ASSIGNMENT
EICAS L/R-A-1	FUEL QTY IND SYS	ILS R-A-2/MMR R	LOC TEST/TUNE INHIBIT
ILS C-A-2/MMR C	G/S RECEIVER FAIL - C	ILS C-A-2/MMR C	LOCALIZER DEV
ILS L-A-2/MMR L	G/S RECEIVER FAIL - L	ILS L-A-2/MMR L	LOCALIZER DEV
ILS R-A-2/MMR R	G/S RECEIVER FAIL - R	ILS R-A-2/MMR R	LOCALIZER DEV
EICAS L/R-A-1	GEAR DOWN SYS 1 - L	EFIS L/C-A-1	LOCALIZER DEV CAPT
EICAS L/R-A-1	GEAR DOWN SYS 1 - N	EEC L-A-1	LOOP NO (BIT 2) - L
EICAS L/R-A-1	GEAR DOWN SYS 1 - R	EEC R-A-1	LOOP NO (BIT 2) - R
EICAS L/R-A-1	GEN GCB OPEN - L	EEC L-A-1	LOOP NO (BIT 3) - L
EICAS L/R-A-1	GEN GCB OPEN - R	EEC R-A-1	LOOP NO (BIT 3) - R
ILS C-A-2/MMR C	GLIDESLOPE DEV	EEC L-A-1	LOOP NO (BIT 4) - L
ILS L-A-2/MMR L	GLIDESLOPE DEV	EEC R-A-1	LOOP NO (BIT 4) - R
ILS R-A-2/MMR R	GLIDESLOPE DEV	EEC L-A-1	LOOP NO (LSB) - L
EFIS L/C-A-1	GLIDESLOPE DEV CAPT	EEC R-A-1	LOOP NO (LSB) - R
FMC L/R-D-4	GPS HOURS	EEC L-A-1	LOOP NO (MSB) - L
FMC L/R-D-4	GPS MINUTES	EEC R-A-1	LOOP NO (MSB) - R
FMC L/R-D-4	GPS SECONDS	ADC L/R-A-4	MACH
ILS C-A-2/MMR C	GS TEST/TUNE INHIBIT	EFIS L/C-A-1	MAG/TRUE DATA CAPT
ILS L-A-2/MMR L	GS TEST/TUNE INHIBIT	EFIS L/C-A-1	MAG/TRUE STATUS CAPT
ILS R-A-2/MMR R	GS TEST/TUNE INHIBIT	EICAS L/R-A-1	MAIN BATT CURRENT
EICAS L/R-A-1	HYD QUANT - C	EICAS L/R-A-1	MAIN BATT SWITCH
EICAS L/R-A-1	HYD QUANT - L	PRESS SW	MAIN/ALT BRAKE SEL
EICAS L/R-A-1	HYD QUANT - R		MB INNER
EICAS L/R-A-1	HYD SYS LO QTY - C		MB MIDDLE
EICAS L/R-A-1	HYD SYS LO QTY - L		MB OUTER
EICAS L/R-A-1	HYD SYS LO QTY - R	ILS C-A-2/MMR C	MLS DIR ANTSEL CMD ACK
EICAS L/R-A-1	ICE DETECTOR - L	ILS L-A-2/MMR L	MLS DIR ANTSEL CMD ACK
EICAS L/R-A-1	ICE DETECTOR - R	ILS R-A-2/MMR R	MLS DIR ANTSEL CMD ACK
EICAS L/R-A-1	ICING ENGINE/DETECTOR	EICAS L/R-A-1	N2 CORRECTED TO 2.5 - L
EICAS L/R-A-1	ICING WING	EICAS L/R-A-1	N2 CORRECTED TO 2.5 - R
EICAS L/R-A-1	IDG OIL LEVEL - R	A/G RELAY	NOSE GEAR SQUAT SW
EICAS L/R-A-1	IDG OIL TEMP-R	TCAS	PILOT SL
ILS C-A-2/MMR C	ILS FAILURE - C	FMC L/R-D-4	PRES POSN LAT-LSData
ILS L-A-2/MMR L	ILS FAILURE - L	FMC L/R-D-4	PRES POSN LAT-MSData
ILS R-A-2/MMR R	ILS FAILURE - R	FMC L/R-D-4	PRES POSN LONG-LSData
ILS L-A-2/MMR L	ILS FREQ/MLS /GLS CHAN	FMC L/R-D-4	PRES POSN LONG-MSData
ILS L-A-2/MMR L	ILS FREQ/MLS /GLS CHAN	EFIS L/C-A-1	R FCC DATA FAULT CAPT
EFIS L/C-A-1	L ADF DATA FAULT CAPT	EFIS L/C-A-1	R FMC DATA FAULT CAPT
EICAS L/R-A-1	L ENG BLEED OVHT	EFIS L/C-A-1	R IRS DATA FAULT CAPT
EFIS L/C-A-1	L FCC DATA FAULT CAPT	EICAS L/R-A-1	R MAIN PITOT HEAT
EFIS L/C-A-1	L FMC DATA FAULT CAPT	LRRA C-A-2	RADIO HEIGHT LSB
EICAS L/R-A-1	L MAIN PITOT HEAT	LRRA L-A-2	RADIO HEIGHT LSB
EFIS L/C-A-1	L VOR DATA FAULT CAPT	LRRA R-A-2	RADIO HEIGHT LSB
ILS C-A-2/MMR C	LOC RECEIVER FAIL - C	EFIS L/C-A-1	RADIO HEIGHT LSB CAPT
ILS L-A-2/MMR L	LOC RECEIVER FAIL - L	LRRA C-A-2	RADIO HEIGHT MSB
ILS R-A-2/MMR R	LOC RECEIVER FAIL - R	LRRA L-A-2	RADIO HEIGHT MSB
ILS C-A-2/MMR C	LOC TEST/TUNE INHIBIT	LRRA R-A-2	RADIO HEIGHT MSB
ILS L-A-2/MMR L	LOC TEST/TUNE INHIBIT	EFIS L/C-A-1	RADIO HEIGHT MSB CAPT

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PORT NAME	PARAMETER ASSIGNMENT	PORT NAME	PARAMETER ASSIGNMENT
TCAS	REPLY INFORMATION	TCAS	TCAS SYSTEM STATUS
EICAS L/R-A-1	RUDDER PCU	EFIS R/C-A-1	TERRAIN DATA DISPLYD F/O
SAM	SAM TRIM DOWN CMD L	FQPU	TOTAL FUEL QUANTITY
SAM	SAM TRIM DOWN CMD R	ADC L/R-A-4	TOTAL PRESSURE
SAM	SAM TRIM UP CMD LEFT	EFIS L/C-A-1	TRUE HEADING CAPT
SAM	SAM TRIM UP CMD RIGHT	ILS C-A-2/MMR C	TUNING INPUT BUS ACT -C
ILS L-A-2/MMR L	SEL RWY HDG	ILS L-A-2/MMR L	TUNING INPUT BUS ACT -L
VOR L-A-2	SELECTED COURSE - CAPT	ILS R-A-2/MMR R	TUNING INPUT BUS ACT -R
VOR R-A-2	SELECTED COURSE - F/O	TCAS	UP ADVISORY
ILS L-A-2/MMR L	SELECTED LANDING MODE	DFDAU	VENDOR STATUS & DATA
SPD BK LEVER	SPD BRK HDL POSN ANALOG	TCAS	VERTICAL CONTROL
CONFIG	SPD BRKE HDL WIRING DISC	FMC L/R-D-4	VERTICAL DEVIATION
TCAS	SPI	EICAS L/R-A-1	VIB IDENT 1 - L
CONFIG	STAB ANALOG WIRING DISC	EICAS L/R-A-1	VIB IDENT 1 - R
ILS L-A-2/MMR L	STANDBY MODE	EICAS L/R-A-1	VIB IDENT 2 - L
ADC L/R-A-4	STATIC AIR TEMP	EICAS L/R-A-1	VIB IDENT 2 - R
EICAS L/R-A-1	STBY BUS OFF	EFIS R/C-A-1	WXR DATA DISPLAYED F/O
EFIS R/C-A-1	TCAS DATA DISPLAYED F/O	YAW DMPR	YAW DAMPER ENGAGE L
EFIS L/C-A-1	TCAS DISPLAY SEL CAPT	YAW DMPR	YAW DAMPER ENGAGE R
TCAS	TCAS FAILURE		
TCAS	TCAS SL		

Attachment II

Plots of SSFDR Data

United Airlines Flight 93, Pennsylvania

9/11/01

Boeing 757

Vertical Accel (g's)

Eastern Daylight Time (EDT) (hh:mm:ss)

National Transportation Safety Board
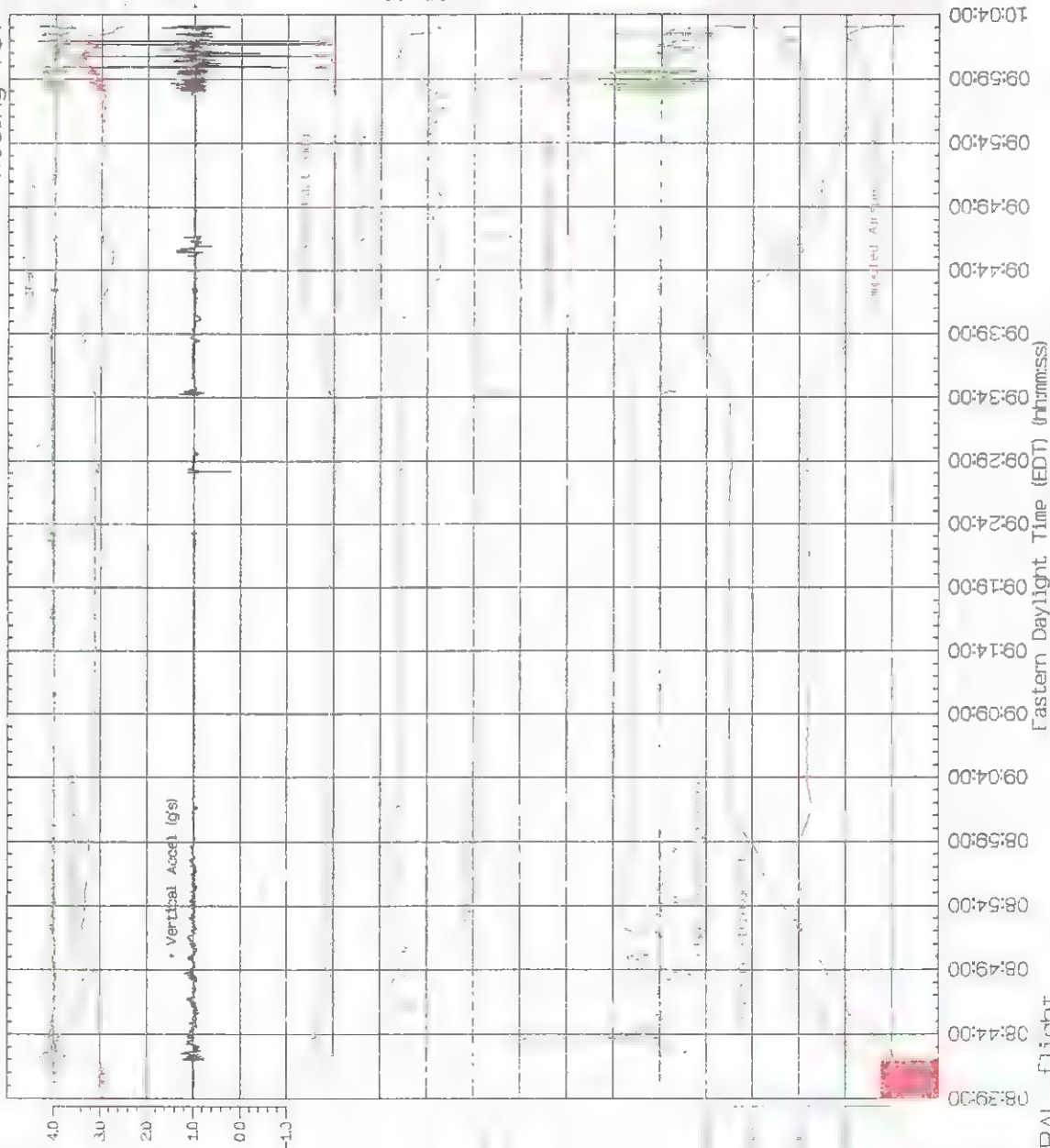
GENERAL flight
Revised: February 12, 2002

United Airlines Flight 93, Pennsylvania

9/11/01

Boeing 757

HF L Keying

a Ctrl Wheel Pos Capt (deg)

Master Warning F/O

L.E. SLATS EXTEND

VHF R Keying

NO WARN / WARN

EXTEND / NOT EXT

NOT KEYED / KEYED

-90 / -60 / 30 / 0 / 30 / 60 / 90

08:39:00 08:44:00 08:49:00 08:54:00 08:59:00 09:04:00 09:09:00 09:14:00 09:19:00 09:24:00 09:29:00 09:34:00 09:39:00 09:44:00 09:49:00 09:54:00 09:59:00 10:04:00

Eastern Daylight Time (EDT) (hh:mm:ss)

ANALOG+DISCRETES flight
Revised: February 12, 2002

National Transportation Safety Board

II-2

United Airlines Flight 93, Pennsylvania

9/11/01

Boeing 757

OVERSPEED
NOT OVRSP

OVERSPEED

NORMAL
ALTN

ADC SELECT SW-CAPT

PRESSURE ALTITUDE (FT)

■ PRESSURE ALTITUDE (FT)

40000
30000
20000
10000
0

08:39:00
08:44:00
08:49:00
08:54:00
08:59:00
09:04:00
09:09:00
09:14:00
09:19:00
09:24:00
09:29:00
09:34:00
09:39:00
09:44:00
09:49:00
09:54:00
09:59:00
10:04:00

Eastern Daylight Time (EDT) (hh:mm:ss)

National Transportation Safety Board

ADC1_flight
February 12, 2002

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DCA01MA065

United Airlines Flight 93, Pennsylvania

9/11/01

Boeing 757

Labels along the top (channels):

- VOR (STD) MODE SEL CAPT / VOR (STD) MODE SEL CAPT NOT SEL
- SELECT NAV AIDS CAPT / NOT SEL
- SELECT FULL COMPASS ROSE CAPT / NOT SEL
- LEFT FMC SELECTED CAPT / RIGHT
- DISABLE FPM ENABLE CAPT / ENABLE FPM ENABLE CAPT
- LEFT DME SELECTED CAPT / RIGHT
- DISABLE ADC SELECT SW-CAPT / ENABLE
- MAP MODE SELECT CAPT / MAP MODE NOT SEL CAPT
- PRESSURE ALTITUDE (FT): 40000, 30000, 20000, 10000, 0

Time axis (EDT): 08:39:00, 08:44:00, 08:49:00, 08:54:00, 08:59:00, 09:04:00, 09:09:00, 09:14:00, 09:19:00, 09:24:00, 09:29:00, 09:34:00, 09:39:00, 09:44:00, 09:49:00, 09:54:00, 09:59:00, 10:04:00

Eastern Daylight Time (EDT) (hh:mm:ss)

National Transportation Safety Board

EFIS1_flight
February 13, 2002

DCA01MA065

II-4

United Airlines Flight 93, Pennsylvania

Boeing 757

9/11/01

* WXR SEL
NOT SEL FCT

DISPLAYED
NOT DISPLAY

SET
NOT SETL

SET
NOT SET

FAULT
OK

* WXR DATA CAPT

* WXR DATA DISPLAYED CAPT

* 160 NI RANGE SEL CAPT

* 20 MI RANGE SEL CAPT

* OP FAULT-L

* PRESSURE ALTITUDE (FT)

PRESSURE ALTITUDE (FT)

40000
30000
20000
10000
0

08:39:00 08:44:00 08:49:00 08:54:00 08:59:00 09:04:00 09:09:00 09:14:00 09:19:00 09:24:00 09:29:00 09:34:00 09:39:00 09:44:00 09:49:00 09:54:00 09:59:00 10:04:00

Eastern Daylight Time (EDT) (hh:mm:ss)

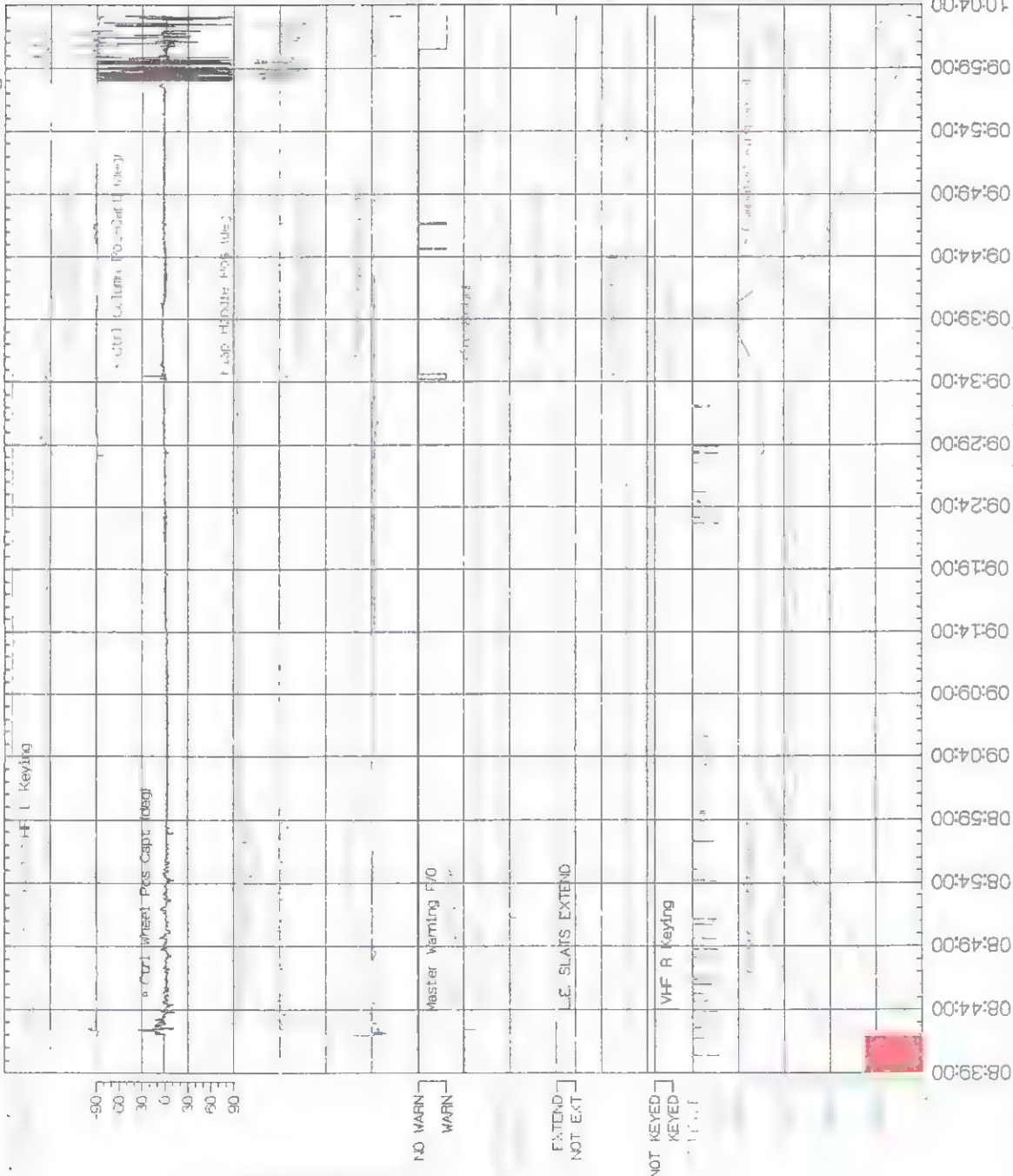EFIS2 flight
February 13, 2002

National Transportation Safety Board

11-5

United Airlines Flight 93, Pennsylvania

Boeing 757

9/11/01

FICAS1 flight
February 12, 2002

Eastern Daylight Time (EDT) (hh:mm:ss)
National Transportation Safety Board

United Airlines Flight 93, Pennsylvania

9/11/01

Boeing 757

EICAS2_flight
February 13, 2002

Eastern Daylight Time (EDT) (hh:mm:ss)

National Transportation Safety Board

II-7

United Airlines Flight 93, Pennsylvania

9/11/01

Boeing 757

ON — OFF
UNLOCKED — LOCKED
FIRE — NORMAL
FIRE — NORMAL
2000 — 0
LO PRESS — NORMAL
LO PRESS — NORMAL

- FWD EQUIP SMOKE
- PASS OXY ON
- RAT UNLOCKED
- CARGO FIRE SW
- MAIN CARGO FIRE
- HYD PRES - (PSI)
- HYD RSVR PRESS~17-C
- HYD SYS LO PRESS-R
- PRESSURE ALTITUDE (FT)

PRESSURE ALTITUDE (FT)
40000
30000
20000
10000
0

Times: 08:39:00 08:44:00 08:49:00 08:54:00 08:59:00 09:04:00 09:09:00 09:14:00 09:19:00 09:24:00 09:29:00 09:34:00 09:39:00 09:44:00 09:49:00 09:54:00 09:59:00 10:04:00

Eastern Daylight Time (EDT) (hh:mm:ss)

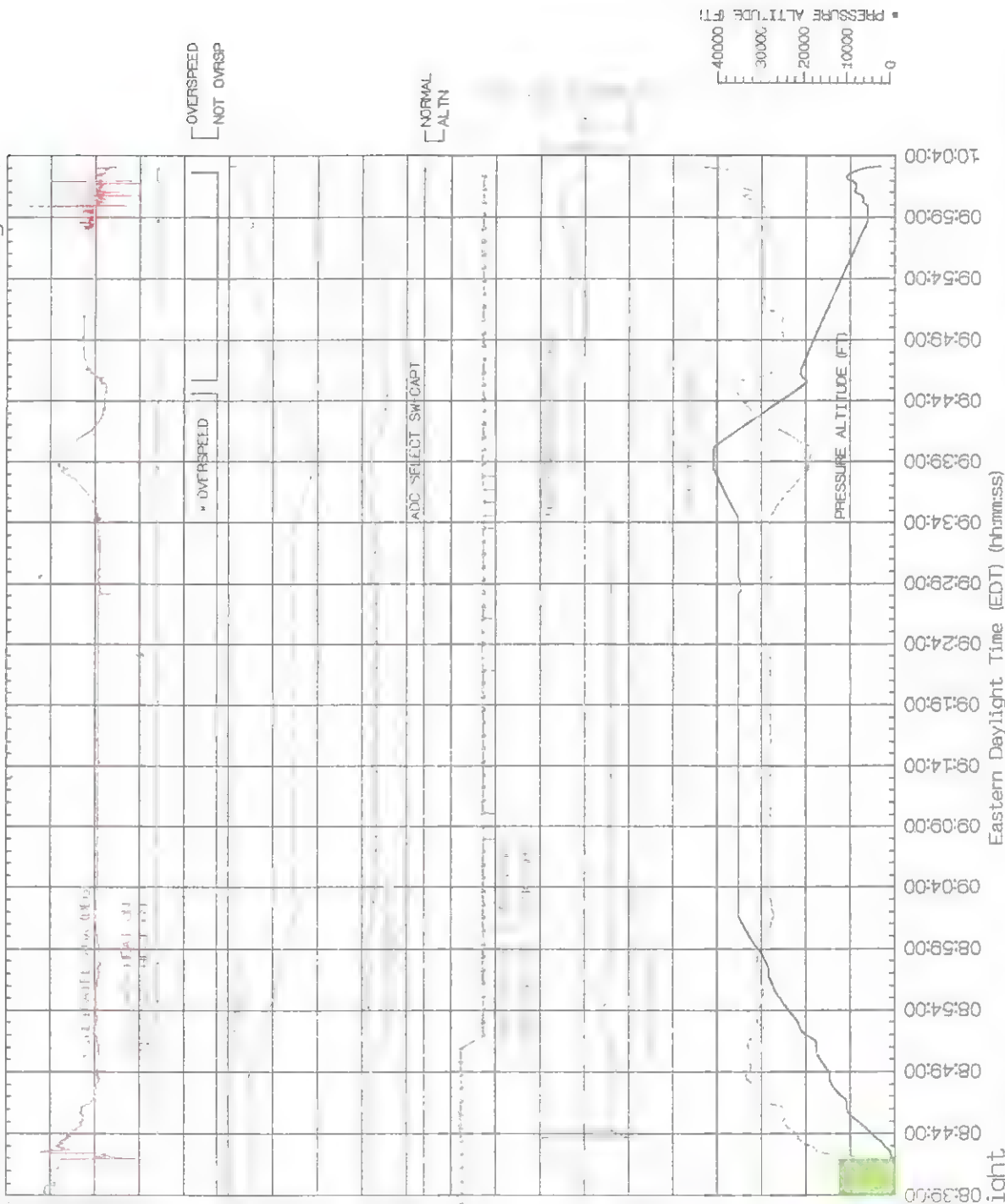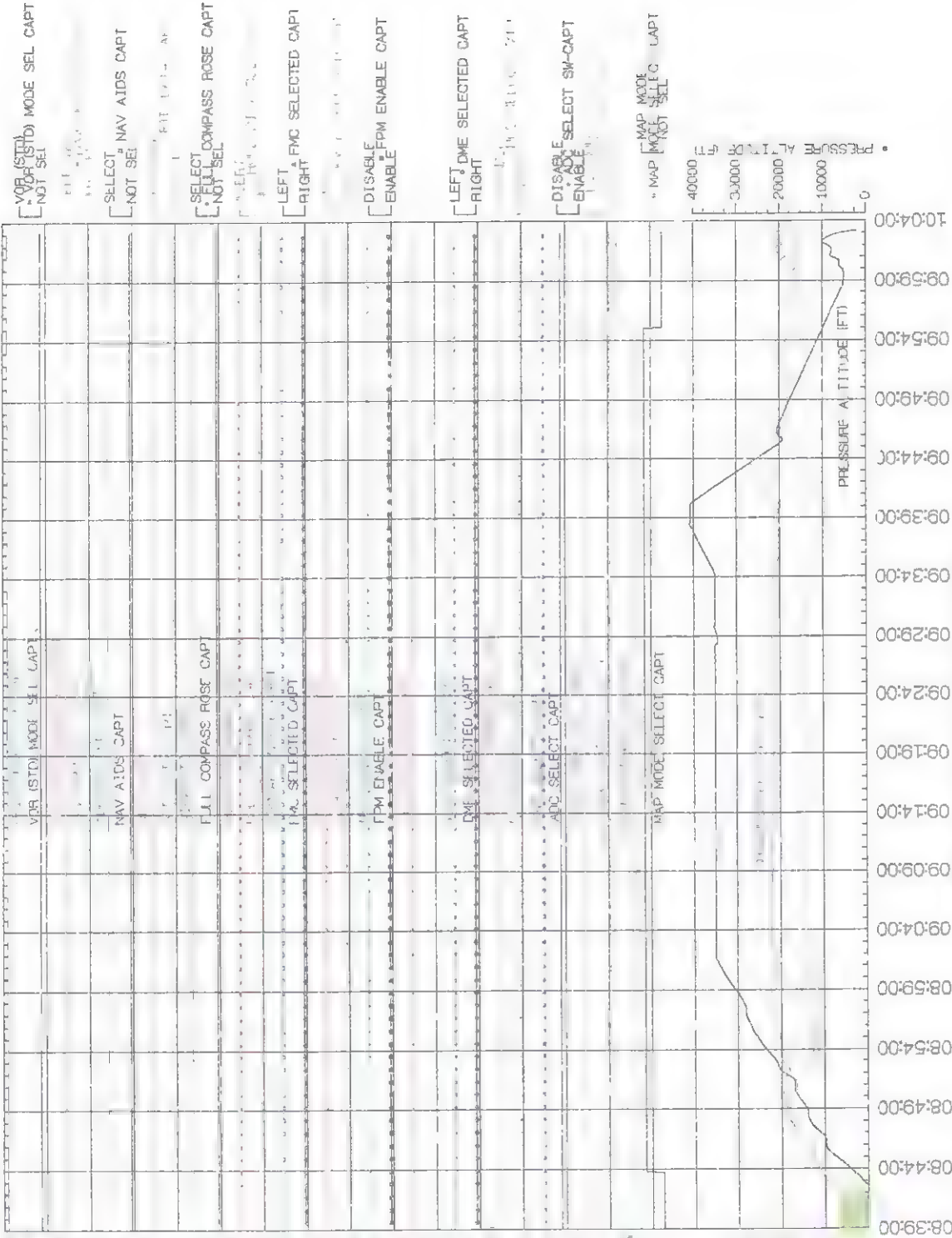EICAS3_flight
February 12, 2002

National Transportation Safety Board

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United Airlines Flight 93, Pennsylvania
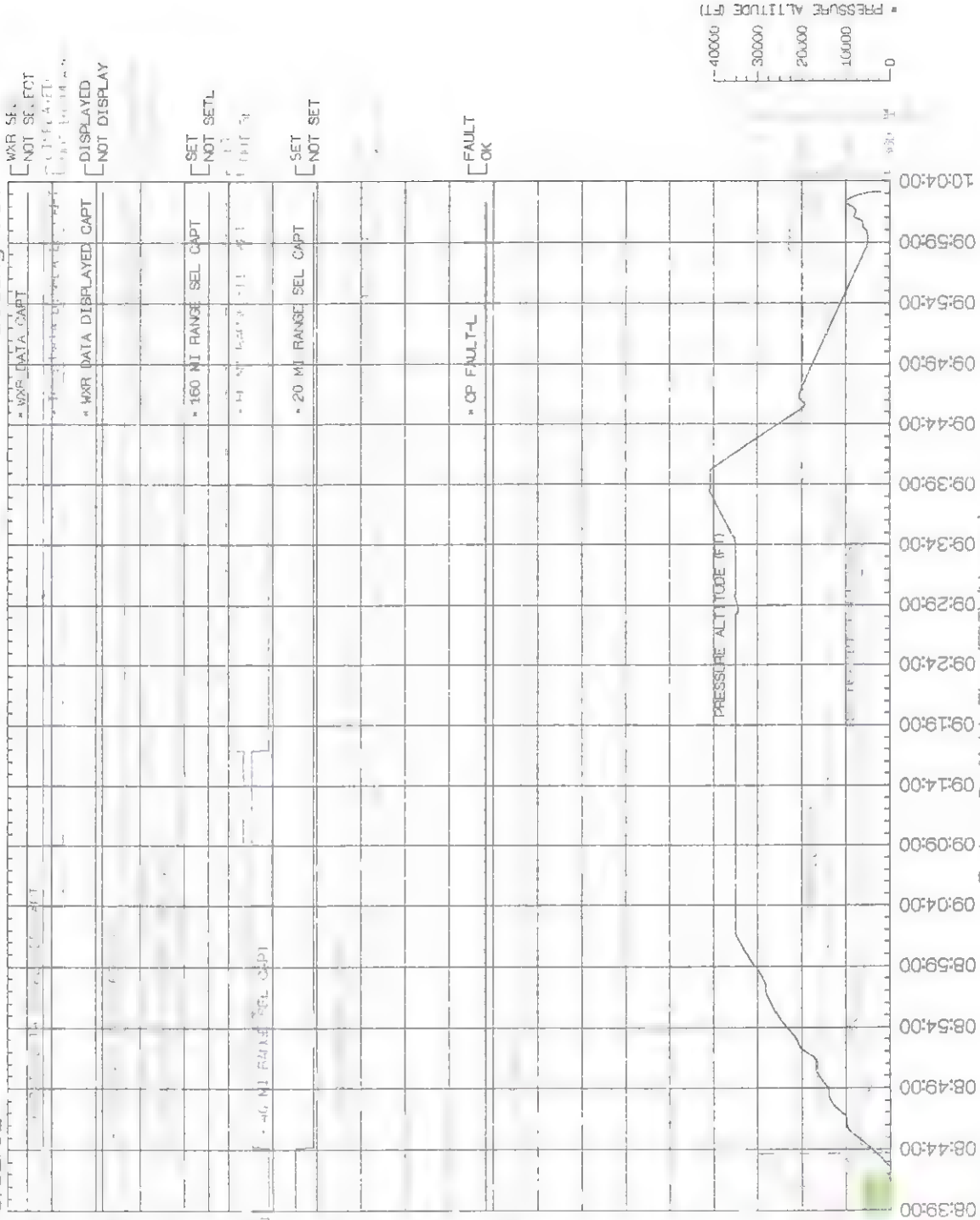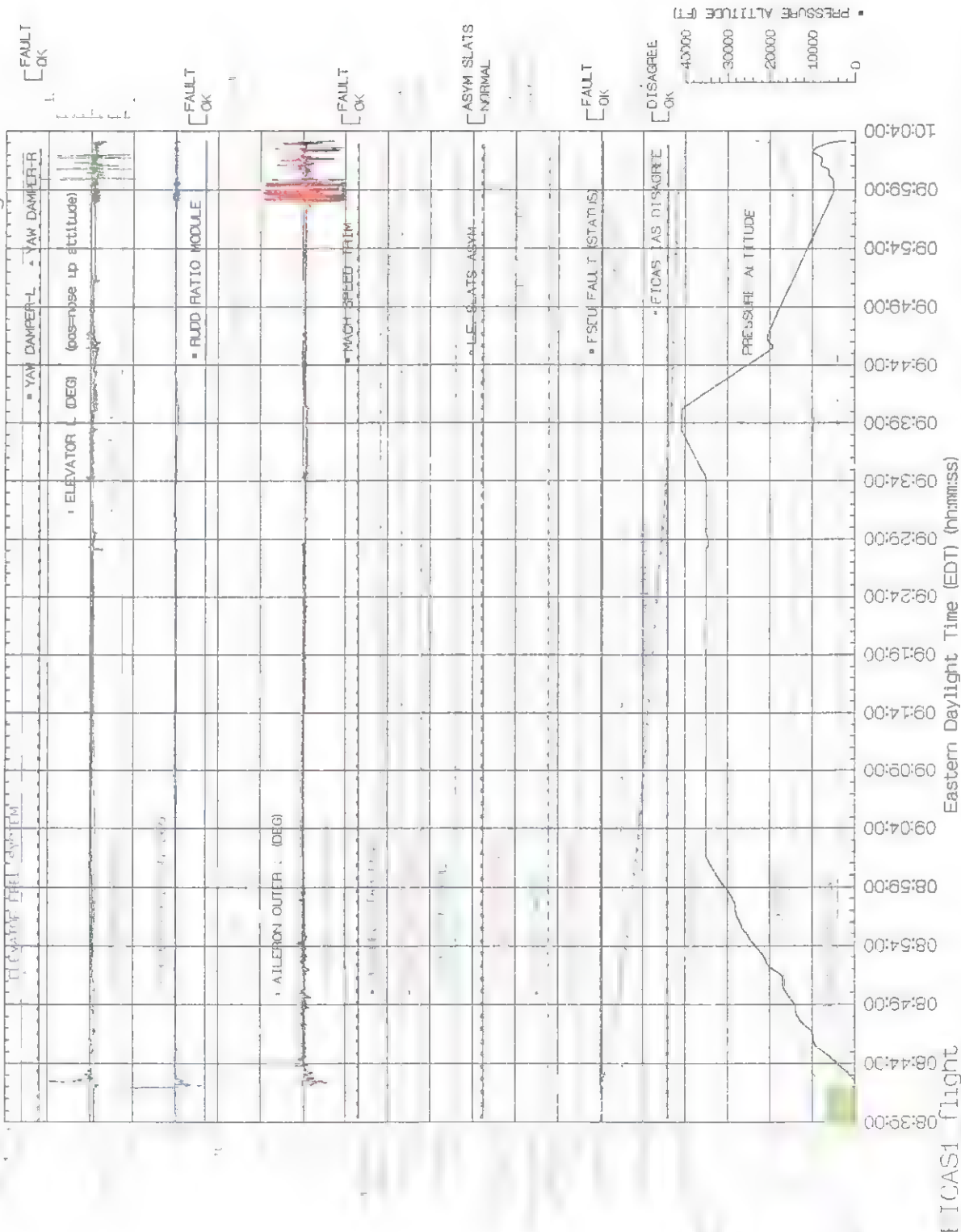
9/11/01

Boeing 757

EICAS4_flight
February 12, 2002

Eastern Daylight Time (EDT) (hh:mm:ss)

National Transportation Safety Board

II-9

DCA01MA065

United Airlines Flight 93, Pennsylvania

9/11/01

Boeing 757

LIGHT ON
LIGHT OFF

LO PRESS
HI PRESS

NOT RUN
ENG RUN

OVHT
NORMAL

0.30
0.00

PRESSURE ALTITUDE (FT)

40000
30000
20000
10000
0

* C-L FUEL PUMP LT

* C-R FUEL PUMP PR

* ENG OUT ALY-R

* L BLEED DUCT LEAK

* FILTER 2 VIB-R (SCALAR)

PRESSURE ALTITUDE (FT)

10:04:00
09:59:00
09:54:00
09:49:00
09:44:00
09:39:00
09:34:00
09:29:00
09:24:00
09:19:00
09:14:00
09:09:00
09:04:00
08:59:00
08:54:00
08:49:00
08:44:00
08:39:00

Eastern Daylight Time (EDT) (hh:mm:ss)

National Transportation Safety Board

EICAS5_flight
February 12, 2002

II-10

United Airlines Flight 93, Pennsylvania
Boeing 757

9/11/01

CONF FAULT
NORMAL

1.50
0.75
0.00

ENG EPR-ACTUAL-R (RATIO)

ENG N1 ACTUAL L (%RPM)

ENG FUEL FILTER-L

FUEL CONFIG

08:39:00 08:44:00 08:49:00 08:54:00 08:59:00 09:04:00 09:09:00 09:14:00 09:19:00 09:24:00 09:29:00 09:34:00 09:39:00 09:44:00 09:49:00 09:54:00 09:59:00 10:04:00

Eastern Daylight Time (EDT) (hh:mm:ss)

National Transportation Safety Board

EICAS6 flight
February 12, 2002

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United Airlines Flight 93, Pennsylvania

9/11/01

Boeing 757

EICAS78EEC_flight.plt
February 12, 2002

Eastern Daylight Time (EDT) (hh:mm:ss)

National Transportation Safety Board

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United Airlines Flight 93, Pennsylvania

9/11/01

Boeing 757
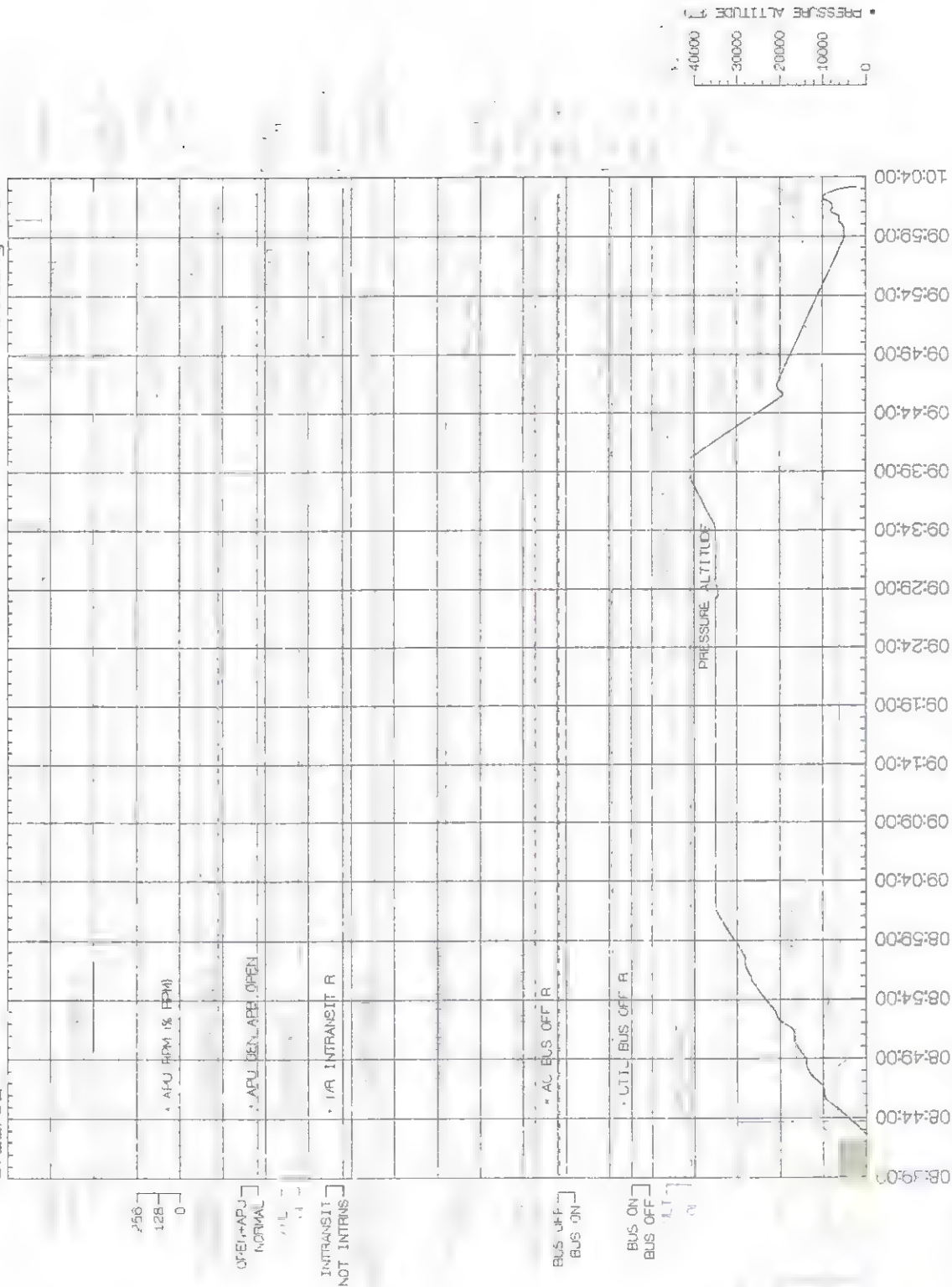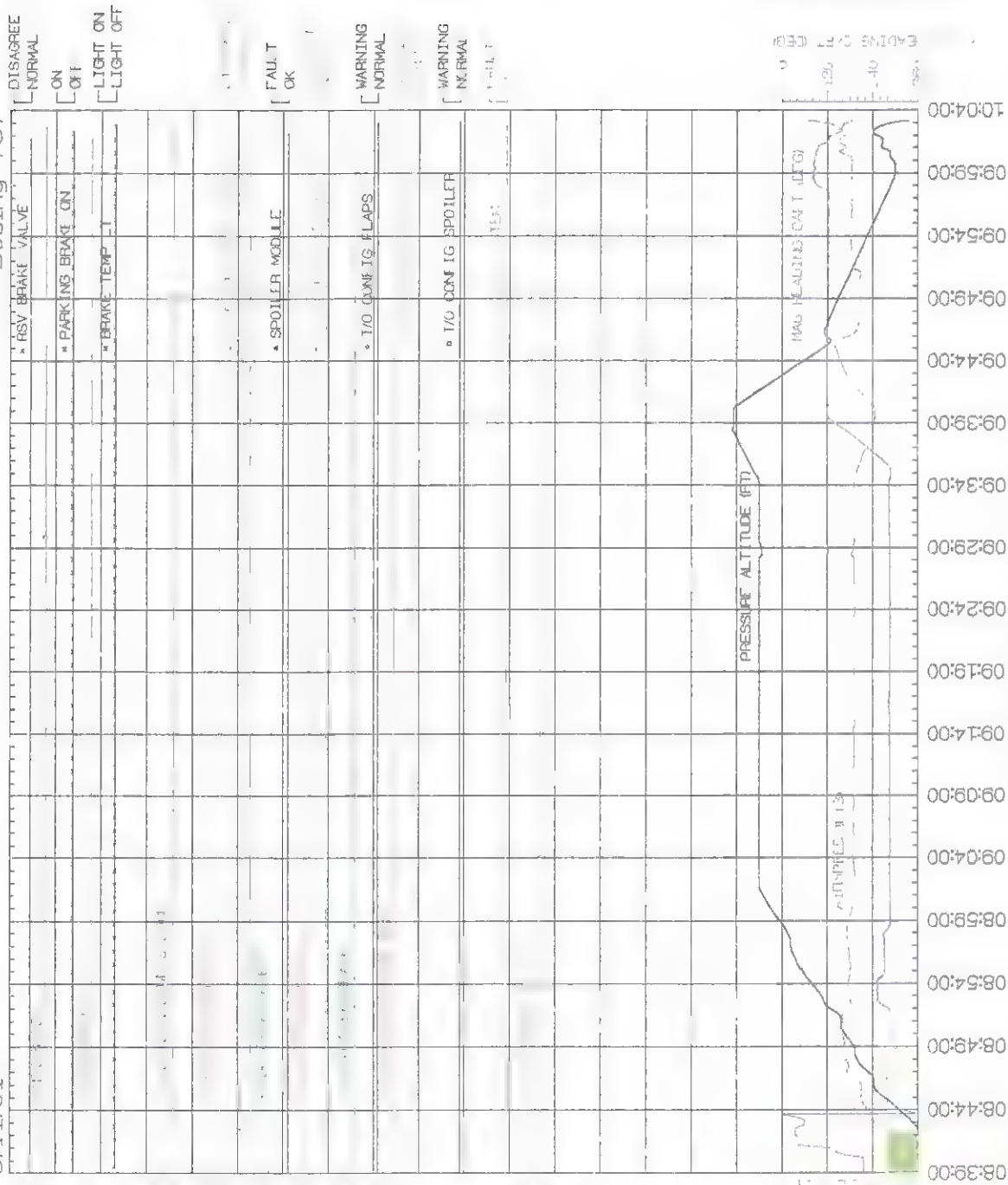
FCC1 flight
February 12, 2002

Eastern Daylight Time (EDT) (hh:mm:ss)

National Transportation Safety Board

II-13

PRESSURE ALTITUDE (FT)

ENABLE
NOT ENABLE

CAPT ON
CAPT OFF

F/O ON
F/O OFF

TRIM DOWN
NO TRIM DN

ALT HOLD ENGA
ENGA NOT

ALT ENGA
ENGA NOT

FWD ENABLE FCCC

FLT DIR ON CAPT FCCC

FLT DIR ON F/O FCCL

AUTOTRIM DOWN FCCL

ALT HOLD MODE OPER FCCL

ALT MODE OPER FCCL

SPD BRK HDL POSN FCCC (%)

STAB POSITION DIG PDR deg

PRESSURE ALTITUDE (FT)

08:39:00 08:44:00 08:49:00 08:54:00 08:59:00 09:04:00 09:09:00 09:14:00 09:19:00 09:24:00 09:29:00 09:34:00 09:39:00 09:44:00 09:49:00 09:54:00 09:59:00 10:04:00

40000 30000 20000 10000 0

United Airlines Flight 93, Pennsylvania

Boeing 757

9/11/01

FCC2 flight
February 12, 2002

Eastern Daylight Time (EDT) (hh:mm:ss)

National Transportation Safety Board

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United Airlines Flight 93, Pennsylvania

9/11/01

Boeing 757

FCC3_flight
February 12, 2002

Eastern Daylight Time (EDT) (hh:mm:ss)

National Transportation Safety Board

II-15

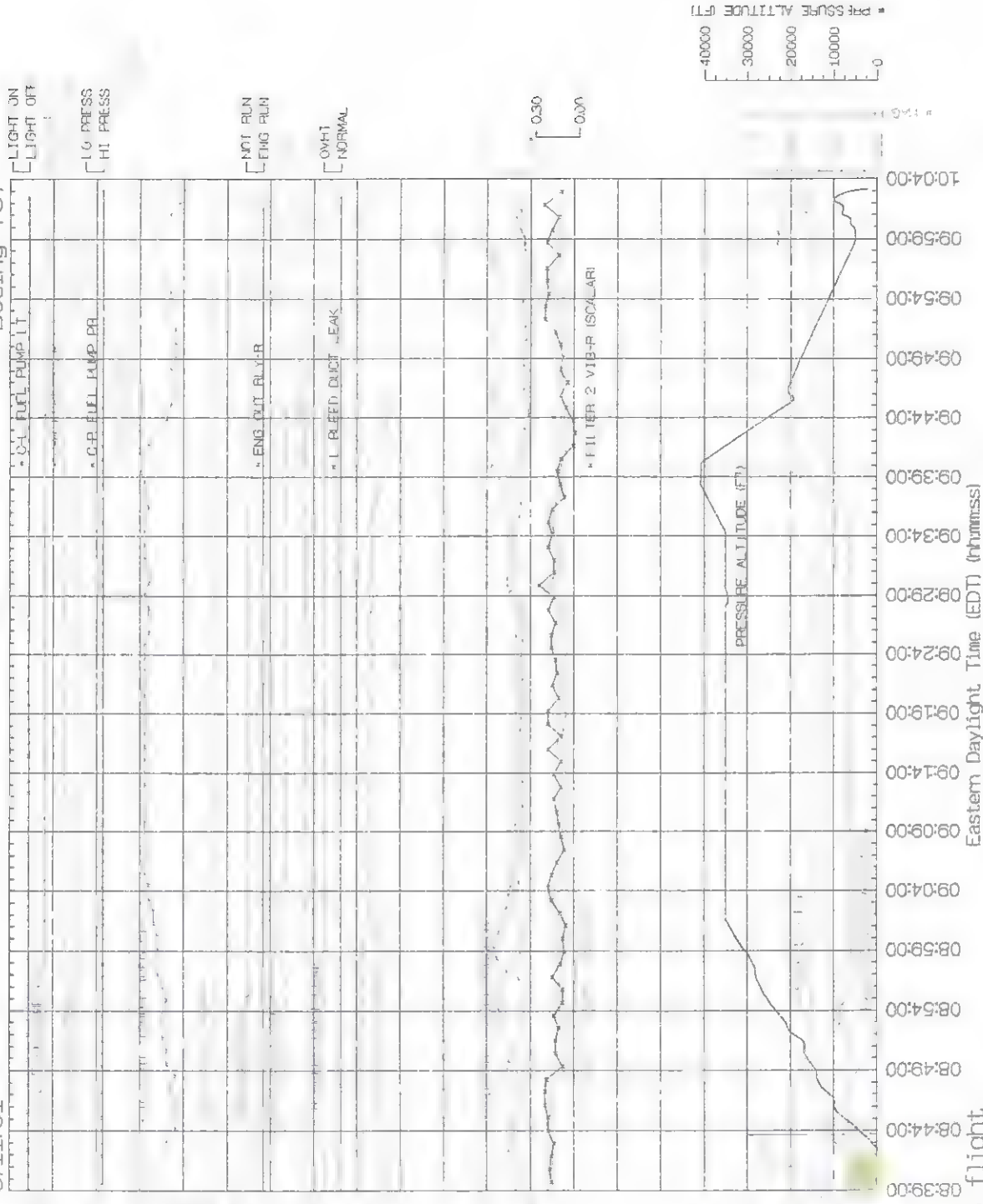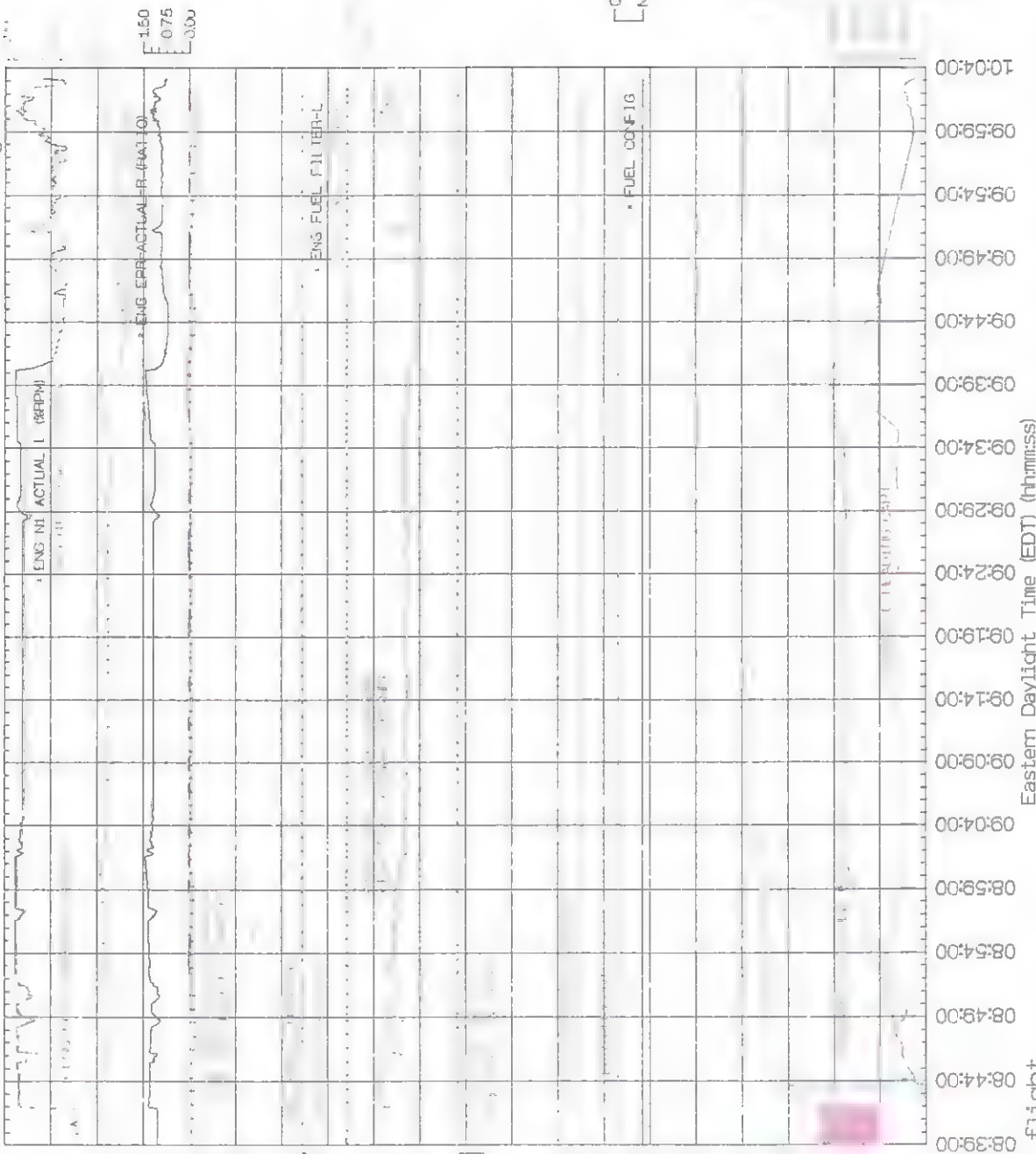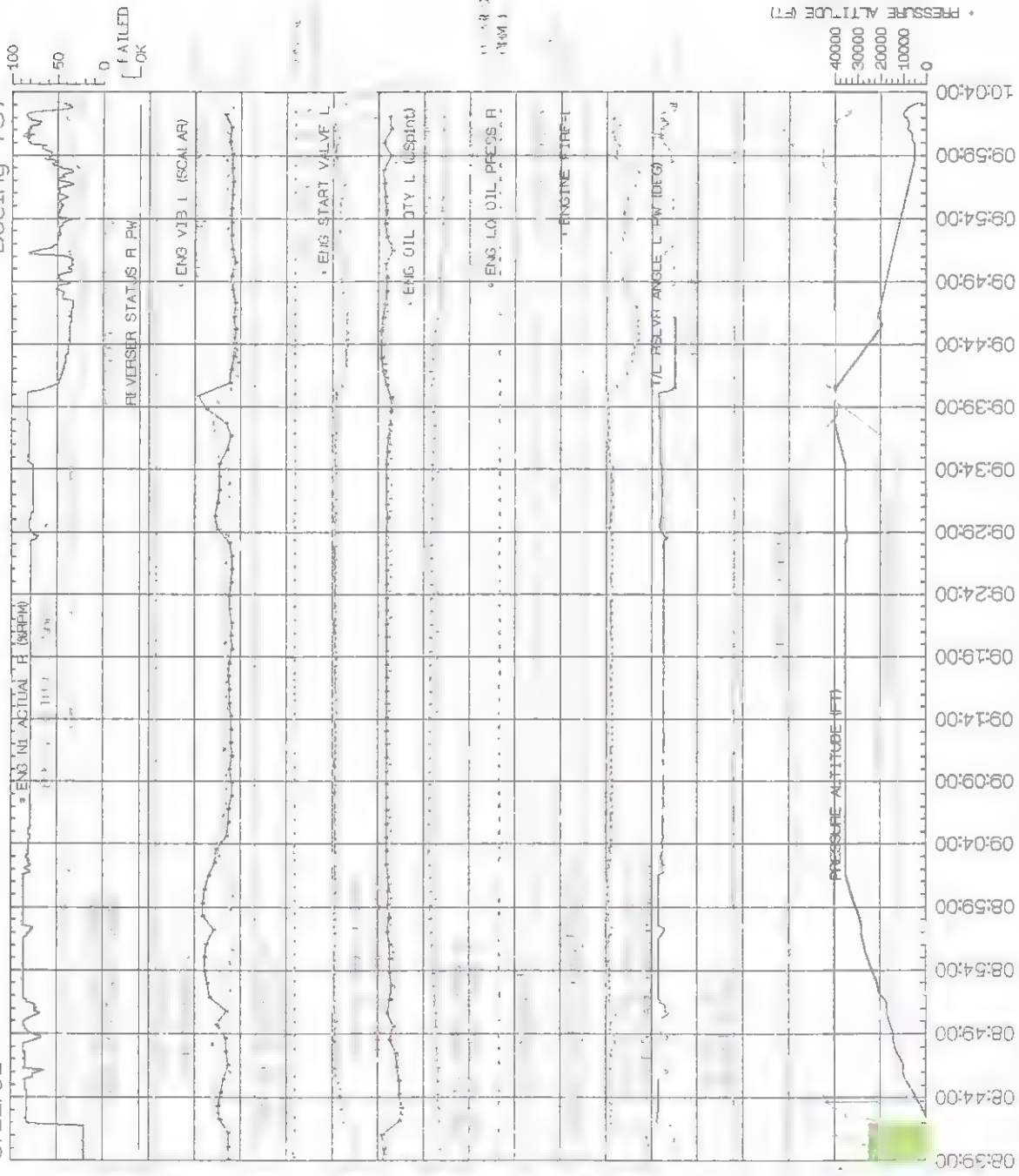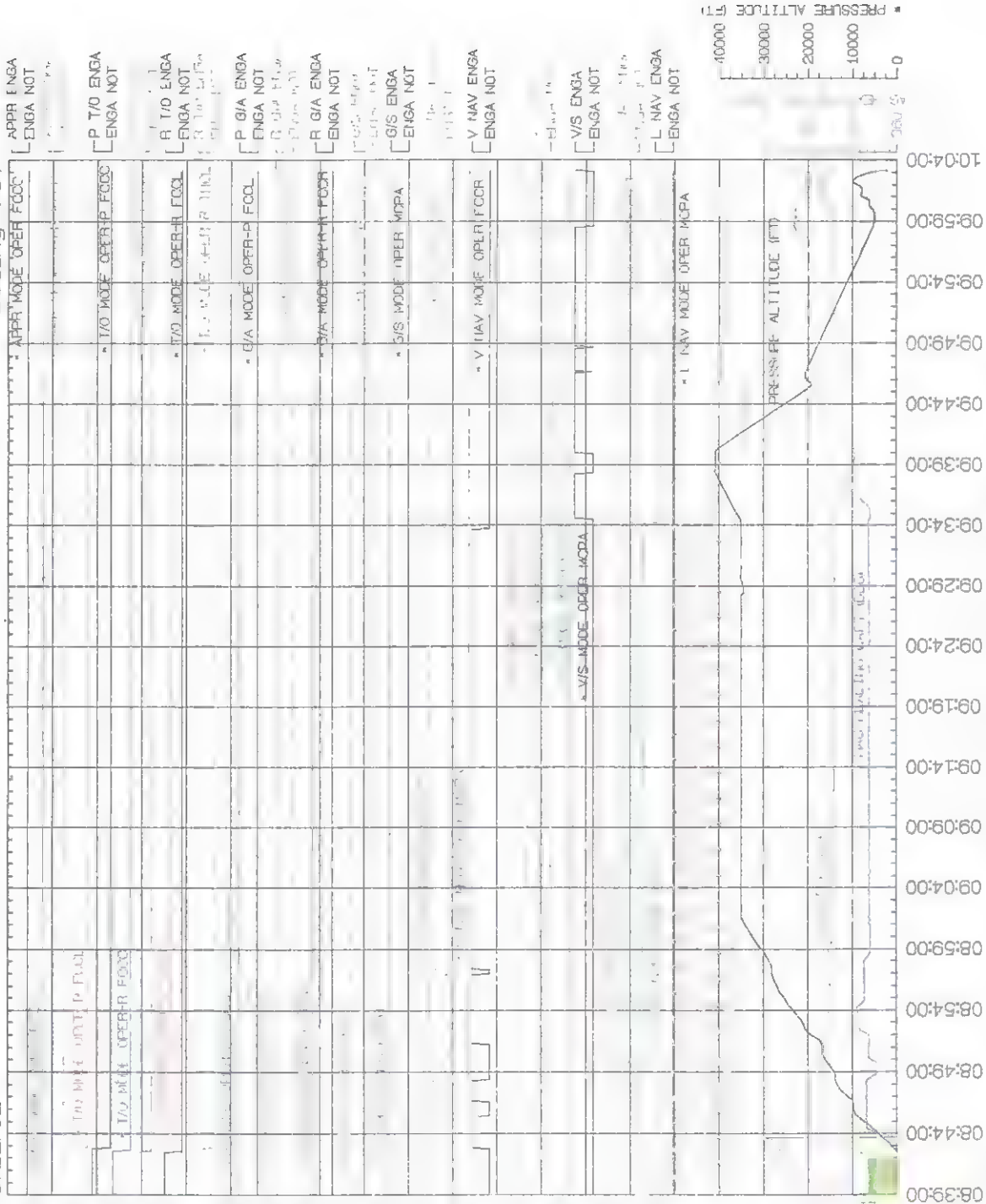United Airlines Flight 93, Pennsylvania

9/11/01

Boeing 757

FCC4_flight
February 12, 2002

Eastern Daylight Time (EDT) (hh:mm:ss)

National Transportation Safety Board

* PRESSURE ALTITUDE (FT)

MODE FAIL / NO MODE FAIL
MODE FAIL / NO MODE FAIL
MODE FAIL / NO MODE FAIL
A/L WARN / A/L WARN NOT
ISA ENGA / ENGA NOT
MIN SPD ENGA / ENGA NOT
MACH ENGA / ENGA NOT
FLAP ENGA / ENGA NOT

FMA FAULT 1 (CWS) FCCC
FMA FAULT 2 (PITCH) FCCC
FMA FAULT 3 (ROLL) FCCL
AUTO LAND WARN LT FCCR
TAS FCCC
MIN SPEED FMA
MACH DIS DISC FCCR
FLAP LIMIT FLCC
MACH SELECTED-WARN (MACH)
PRESSURE ALTITUDE (FT)

08:39:00 08:44:00 08:49:00 08:54:00 08:59:00 09:04:00 09:09:00 09:14:00 09:19:00 09:24:00 09:29:00 09:34:00 09:39:00 09:44:00 09:49:00 09:54:00 09:59:00 10:04:00

1.00 0.50 0.00

40000 30000 20000 10000 0

United Airlines Flight 93, Pennsylvania

9/11/01

Boeing 757

CWS C ENGA / ENGA NOT
CWS L ENGA / ENGA NOT
CWS R ENGA / ENGA NOT
CWS R ENGA / ENGA NOT
CMD C ENGA / ENGA NOT
CMD L ENGA / ENGA NOT
CMD R ENGA / ENGA NOT
A/P WARN / WARN NOT
A/P CAUTN / CAUTN NOT

PRESSURE ALTITUDE (FT)

40000 30000 20000 10000 0

* PRESSURE ALTITUDE (FT)

Eastern Daylight Time (EDT) (hh:mm:ss)

08:39:00 08:44:00 08:49:00 08:54:00 08:59:00 09:04:00 09:09:00 09:14:00 09:19:00 09:24:00 09:29:00 09:34:00 09:39:00 09:44:00 09:49:00 09:54:00 09:59:00 10:04:00

National Transportation Safety Board

FCC5_flight
February 12, 2002

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DCA01MA065

United Airlines Flight 93, Pennsylvania

9/11/01

Boeing 757

OPER
INOPER

DME/DME

REQD NAV PERF (RNP) (NM)
40
0

IRS (R) MODE_OPER

OPER
INOPER

IRS SELECT SW CAPT

NORMAL
ALTN

WIND SPEED (KNOTS)
50
0

PRESSURE ALTITUDE (FT)

PRESSURE ALTITUDE (FT)
40000
30000
20000
10000
0

08:39:00 08:44:00 08:49:00 08:54:00 08:59:00 09:04:00 09:09:00 09:14:00 09:19:00 09:24:00 09:28:00 09:34:00 09:39:00 09:44:00 09:49:00 09:54:00 09:59:00 10:04:00

Eastern Daylight Time (EDT) (hh:mm:ss)

FMC1_flight
February 15, 2002

National Transportation Safety Board

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United Airlines Flight 93, Pennsylvania

9/11/01

Boeing 757

DOCDATA_flight
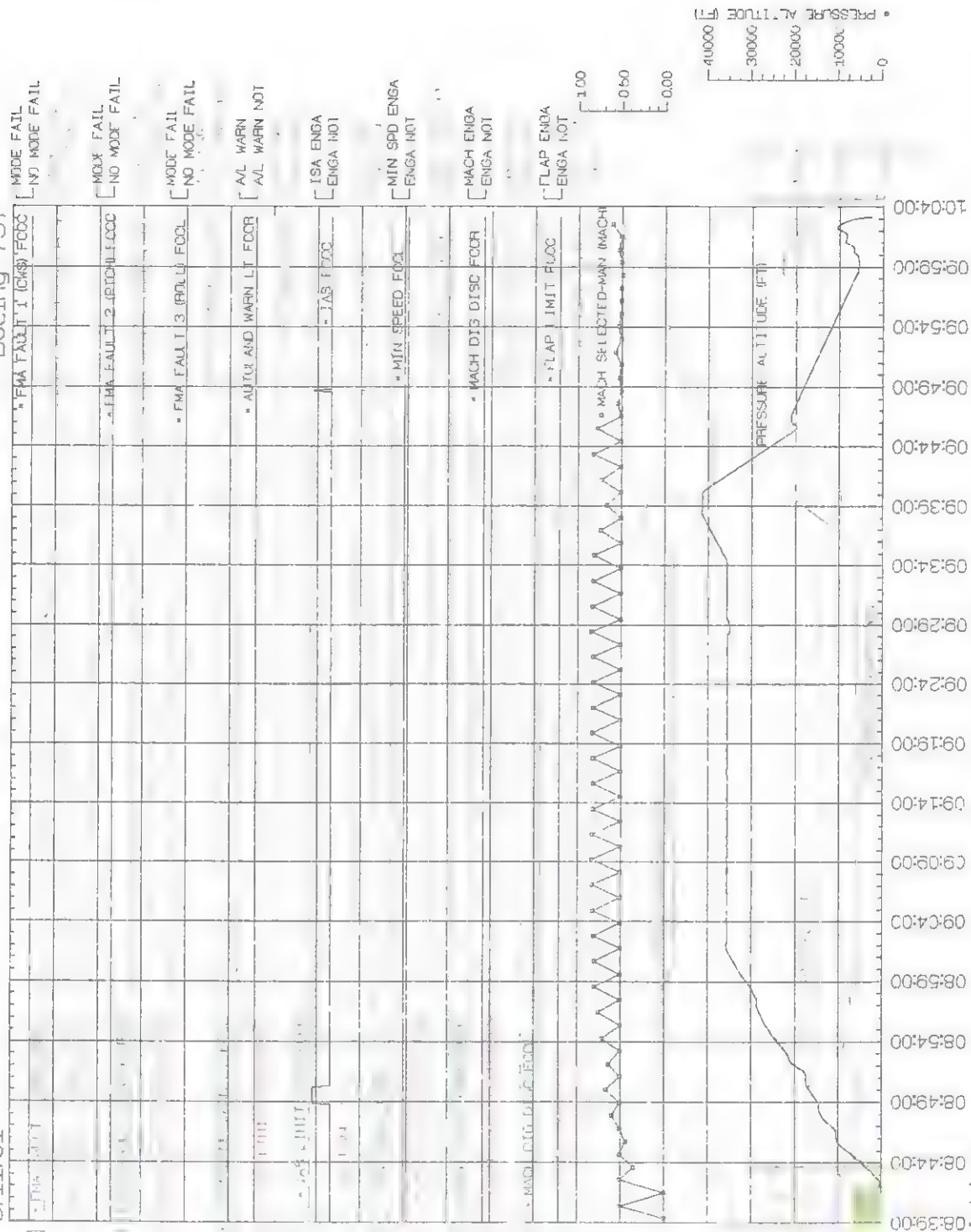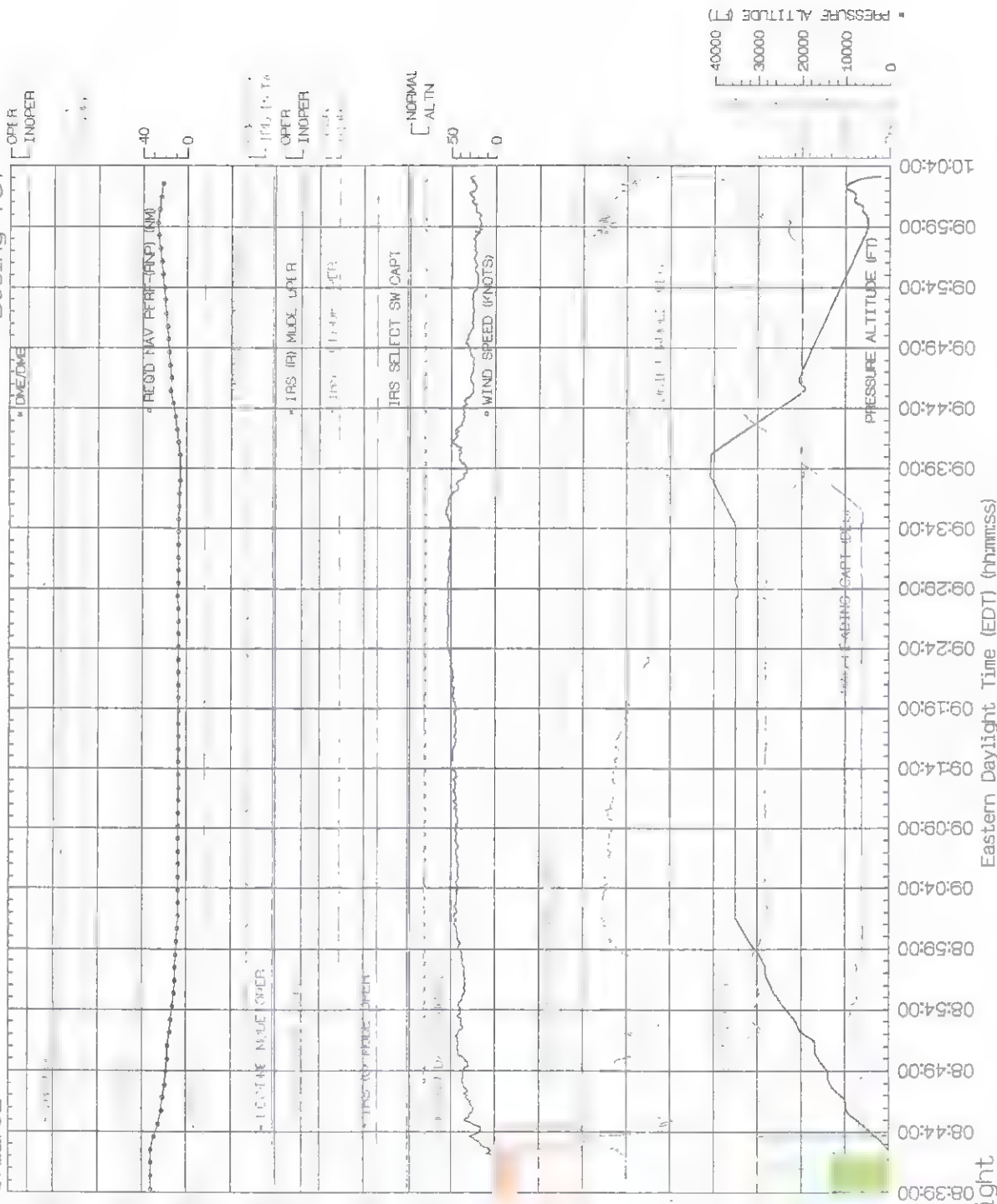February 13, 2002

Eastern Daylight Time (EDT) (hh:mm:ss)

National Transportation Safety Board

II-19

United Airlines Flight 93, Pennsylvania

9/11/01

Boeing 757

VOR/DME/LRRA_flight
February 12, 2002

Eastern Daylight Time (EDT) (hh:mm:ss)
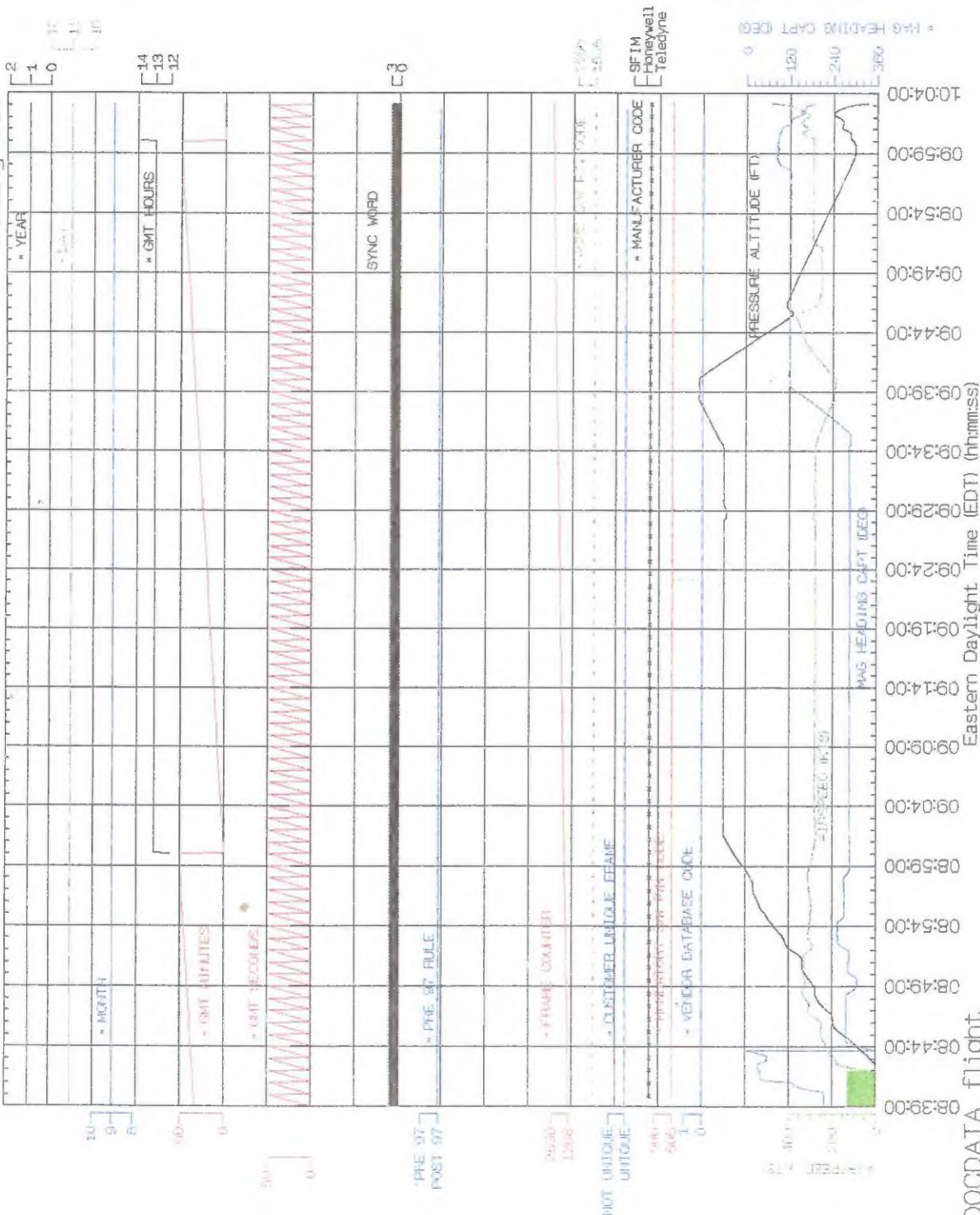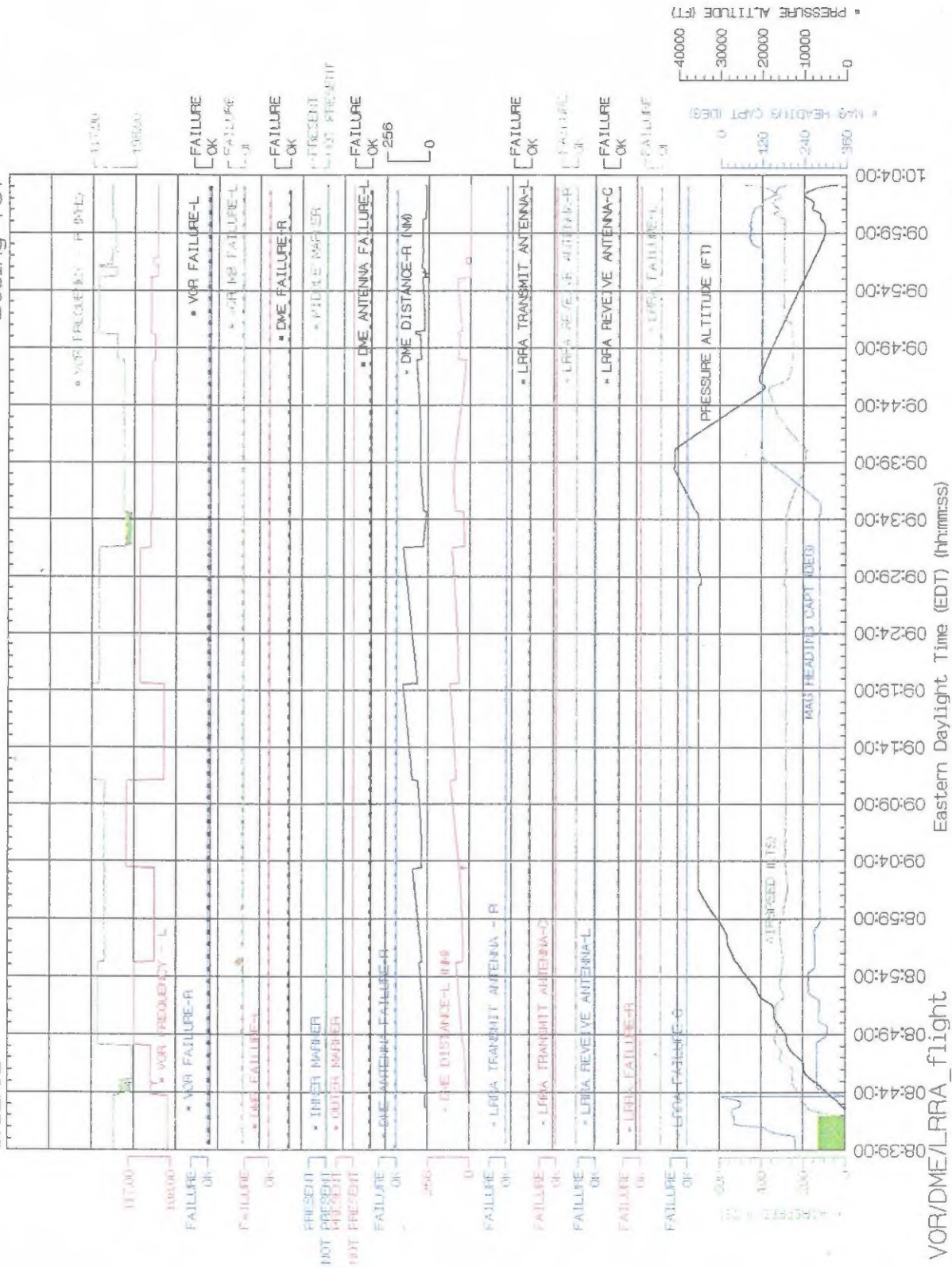
National Transportation Safety Board

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United Airlines Flight 93, Pennsylvania

9/11/01

Boeing 757

TCM1_flight
February 12, 2002

Eastern Daylight Time (EDT) (hh:mm:ss)

National Transportation Safety Board

DCA01MA065

II-21

United Airlines Flight 93, Pennsylvania

9/11/01

Boeing 757

* CAUTION WINDSHEAR
* SHEAR WINDSHEAR WINDSHEAR
* NOT USED
* TOO LOW GEAR
* GLIDESLOPE CANCEL
* TERRAIN CAUTION
* OBSTACLE WARNING
* TERRAIN AWARELESS NOT AVAIL
* TERRAIN DISPLAY DISCRETE 1 ON
* GPW FAILURE
* SINK RATE
* TERRAIN
* TOO LOW TERRAIN
* TERRAIN AHEAD PULL UP
* GROUND PROX WARNING
* WINDSHEAR CAUTION
* WINDSHEAR WARNING

* PREDICTIVE WINDSHEAR
* MINIMUMS
* TOO LOW FLAP
* GLIDESLOPE
* TERRAIN WARNING
* TERRAIN AWARENESS INOP
* CAUTION OBST OR OBSTAHEAD
* TERRAIN DISPLAY DISCRETE 1 ON
* TERRAIN OVERRIDE
* GROUND PROX INOP
* PULL UP
* DON'T SINK
* CAUTION TERRAIN
* TERRAIN AHEAD
* GPWS ALERT
* WINDSHEAR INOP

WARNING
CAUTION
*
NO ALERT

NOT TRUE / TRUE

PRESSURE ALTITUDE (FT)
40000
30000
20000
10000
0

MAG HEADING CAPT (DEG)
0
120
240
360

PRESSURE ALTITUDE (FT)

MAG HEADING CAPT (DEG)

AIRSPEED (kts)

WINDSPEED (kt)

Eastern Daylight Time (EDT) (hh:mm:ss)

08:39:00 08:44:00 08:49:00 08:54:00 08:59:00 09:04:00 09:09:00 09:14:00 09:19:00 09:24:00 09:29:00 09:34:00 09:39:00 09:44:00 09:49:00 09:54:00 09:59:00 10:04:00

GPWC1_flight
February 12, 2002

National Transportation Safety Board

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DCA01MA065